MoDOT & Patrol Employees' Retirement System

2021 Annual Comprehensive Financial Report

For The Fiscal Year Ended June 30, 2021

Dependability Through Adversity

MPERS

Serving those who keep us safe.

Missouri Department of Transportation and Highway Patrol Employees' Retirement System
A Component Unit of the State of Missouri

MoDOT and Patrol Employees' Retirement System

A Component Unit of the State of Missouri
Annual Comprehensive Financial Report
for the Fiscal Year Ended June 30, 2021

Scott Simon
Executive Director

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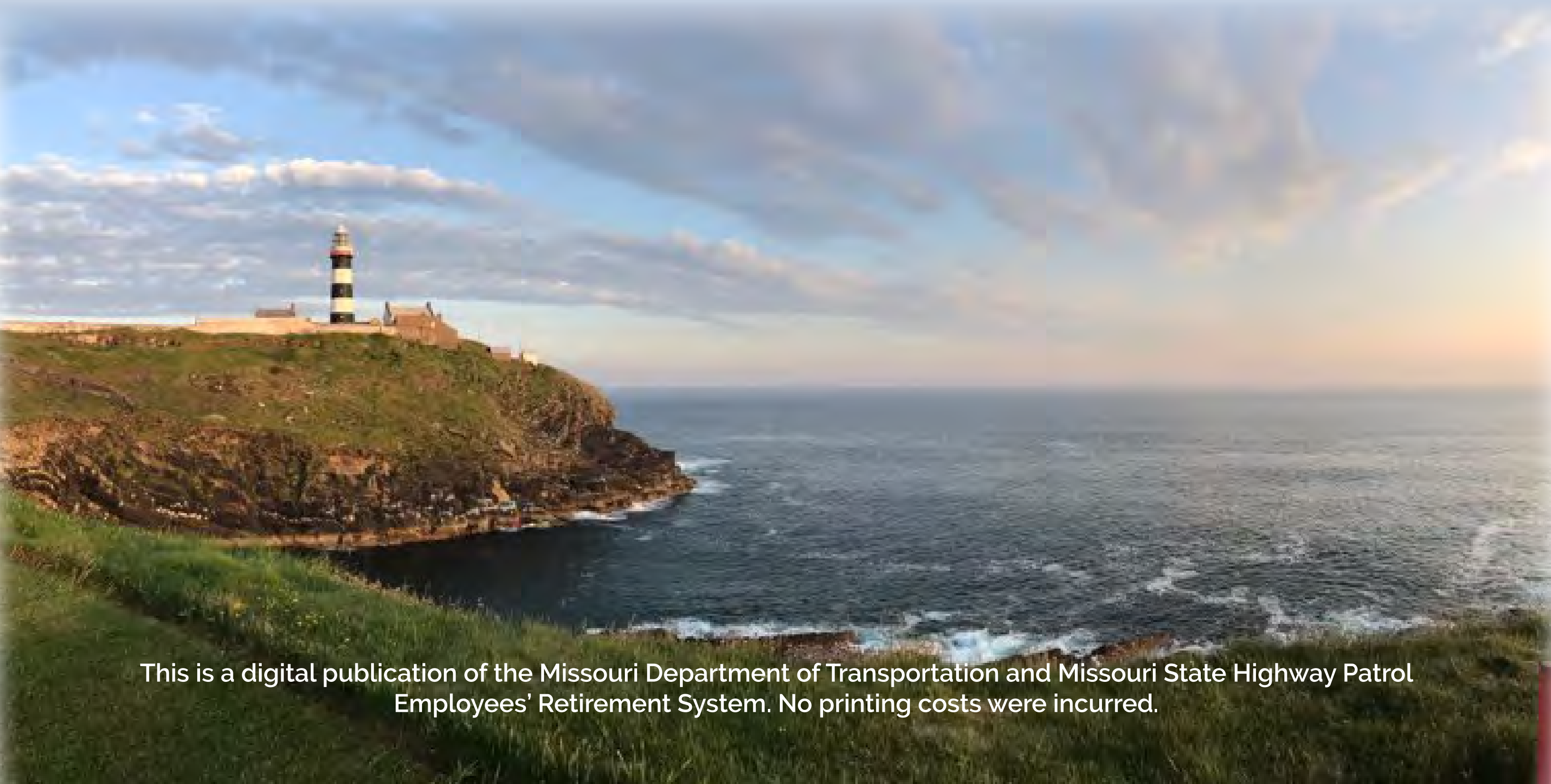

This is a digital publication of the Missouri Department of Transportation and Missouri State Highway Patrol Employees' Retirement System. No printing costs were incurred.

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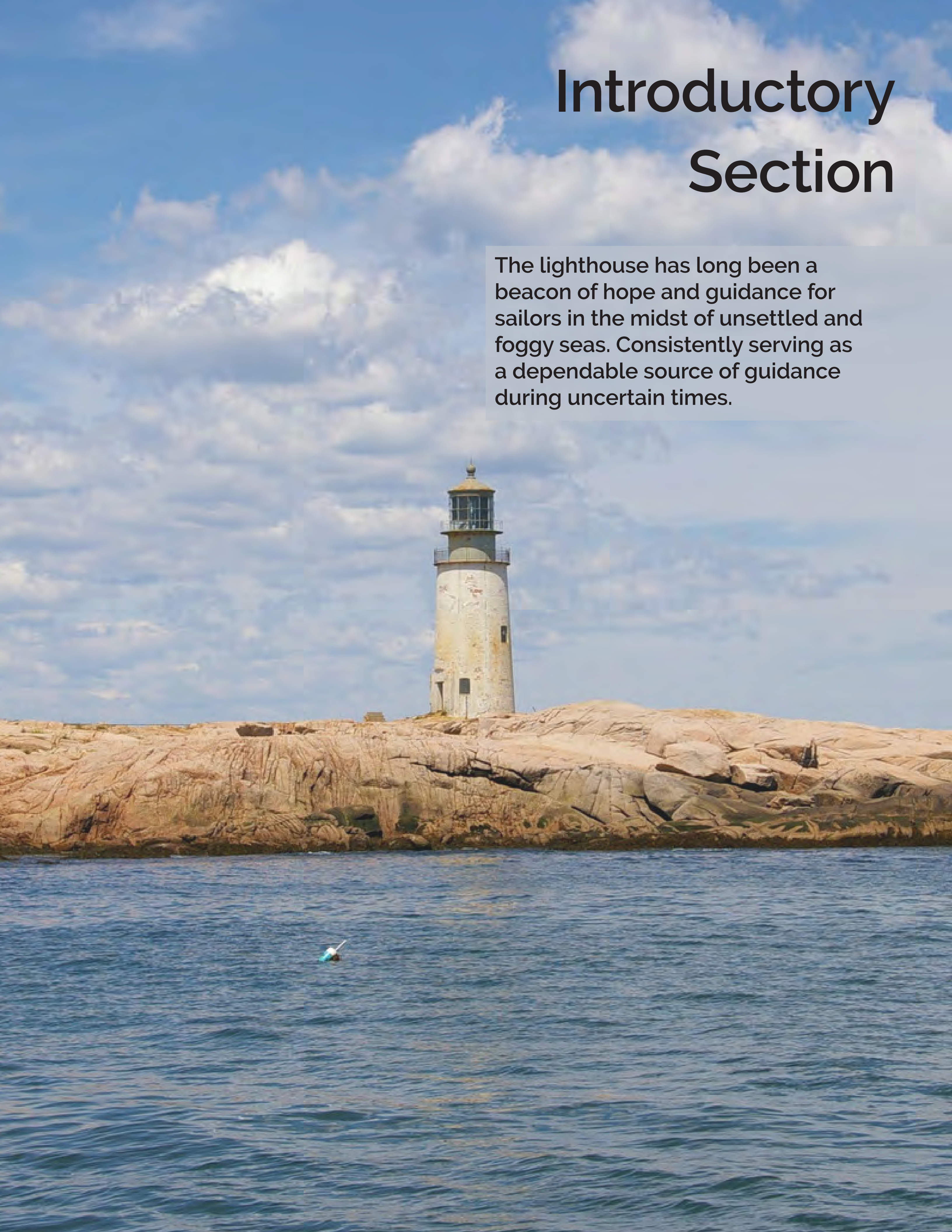
Introductory Section

The lighthouse has long been a beacon of hope and guidance for sailors in the midst of unsettled and foggy seas. Consistently serving as a dependable source of guidance during uncertain times.



MoDOT & Patrol Employees' Retirement System

November 08, 2021

To the Board of Trustees and System Members:

We are pleased to provide this *Annual Comprehensive Financial Report* (*Annual Report*), of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS), for the fiscal year ending June 30, 2021. This report is intended to provide MPERS' stakeholders with a thorough review of the System's operations for the past fiscal year. The material presented in this report has been prepared in a manner intended to be useful and informative to MPERS' members, the management of the Missouri Department of Transportation (MoDOT) and the Missouri State Highway Patrol (MSHP), and the elected officials of the state of Missouri.

MPERS is a defined benefit pension plan designed to be a valuable employee recruitment and retention tool for covered employers. It provides lifetime retirement benefits to eligible MoDOT and MSHP employees. The monthly retirement and survivor benefits provided by MPERS are a valuable source of retirement income for the members we serve. These benefits, when combined with social security and personal savings, provide the basic foundation for our members to leave the workforce and enjoy their retirement years with the dignity they deserve.

The average monthly benefit of a new MPERS retiree in Fiscal Year 2021 retiring directly from active employment was $2,346, which equates to $28,152 per year. Given the increasing cost of living, this amount alone will not provide a life of luxury for the retiree. However, this monthly benefit and those provided by other traditional pension plans have a significant impact that reaches beyond the retirees served. Over the past 10 years alone, MPERS has paid over $2.46 billion in benefit payments to its members. Nearly 95% of these retirees and beneficiaries reside in Missouri, reinvesting their retirement dollars in housing, goods, and services. This reinvestment improves the local economy which in turn, helps to fuel the state's overall economy. The result is that defined benefit pensions have a long-term positive impact on our economy and the lives of our members.

Report Contents and Structure:
This *Annual Report* is designed to comply with the statutory reporting requirements stipulated in sections 104.190, 104.1006, and 105.661 of the Missouri Revised Statutes (RSMo), as amended.

To the best of our knowledge, the information presented is accurate in all material respects and is reported in a manner designed to fairly represent the financial position of the fund. Some amounts included in the financial statements and elsewhere may be based on estimates and judgments. These estimates and judgments are products of best business practices. The accounting policies followed in preparing the basic financial statements conform with U.S. generally accepted accounting principles. Financial information presented throughout the *Annual Report* is consistent with information displayed in the basic financial statements.

The MPERS Board of Trustees (Board) is ultimately responsible for the *Annual Report* and the basic financial statements. MPERS' executive director and staff prepare the information contained in the *Annual Report* and the financial statements to assist the Board in fulfilling its statutory duty.

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Telephone Number: (573) 298-6080 • **Toll Free:** 1-800-270-1271 • **Fax:** (573) 522-6111
Website: www.mpers.org • **E-Mail:** mpers@mpers.org

Systems of internal controls and supporting procedures are maintained to provide assurances that transactions are authorized, assets are safe guarded and proper records are maintained. These controls include standards in the hiring and training of employees, the establishment of an organizational structure, and the communication of policies and guidelines throughout the organization. Inherent limitations exist in all control systems. No evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud have been detected. The objective of internal controls is to provide reasonable assurance the financial statements are free of any material misstatements, recognizing that the cost of a control should not exceed the benefits to be derived.

In accordance with section 104.190 RSMo, an independent auditing firm, Williams-Keepers, LLC, has audited the financial statements included in this report and has issued an unmodified opinion (i.e., no audit concerns relating to MPERS' financial statements). The opinion letter of Williams-Keepers, LLC is presented in the "Financial Section" of this *Annual Report*. "Management's Discussion and Analysis" immediately follows the "Independent Auditors' Report" and provides a narrative introduction, overview, and analysis of the basic financial statements.

Background Information:
MPERS was established by Senate Bill 66 in the 68th General Assembly. In accordance with this legislation, employees of MoDOT and the MSHP became members of the retirement system on September 1, 1955. Effective October 1, 1955, the System accepted 109 retirements. Employees of MPERS became members of the system after passage of Senate Bill 371 in 2001.

The plan provisions have changed many times over the years. The System offers not only enhanced retirement and disability benefits, but also benefits for survivors of active and retired members, benefits for vested former members, and death benefits.

MPERS 11-member board is responsible for the oversight of the System. The trustees serve as fiduciaries to the members and are responsible for selecting and retaining competent management. The trustees and management jointly establish sound policies and objectives, monitor operations for compliance, and oversee performance.

MPERS is considered a component unit of the state of Missouri for financial reporting purposes and, as such, the financial statements in this report are also included in the *State of Missouri's Annual Comprehensive Financial Report.*

Fiscal Year 2021 Highlights:
MPERS' business continuity and disaster preparedness were largely affirmed and improved as a result of the pandemic. This experience has forever changed the way we do business. It has made our organization better. It has substantiated MPERS' "dependability through adversity." The obvious outcomes for the year that made it a success were twofold: 1) no benefit payments were delayed as a result of the pandemic and 2) our investment performance was outstanding. The less obvious, but other very important factors, are briefly noted below.

Fiscal Year 2021 was dominated by the governance project that was conducted and completed in the fall and implemented in the spring. In simplest terms, this project reaffirmed the path of progress for MPERS as a professional and sophisticated partner for the administration of legislated retirement benefits. It also set the stage for additional improvements that will carry that progress well into the future. A few key highlights of this project follow.

First, the assessment reinforced the idea that the governing Board for MPERS is an "oversight" board not a "management" Board. As a lay Board with many individual trustees carrying significant responsibilities outside of MPERS, the Board has hired and developed a professional staff to implement

and administer plan provisions based on Board-approved policies. A lay board lacks the expertise for many of the key functions MPERS provides and is limited in the amount of time allocated to other roles and responsibilities. This is why sound governance is so important. It serves as the foundation for how the organization will function, how it will deliver the promised benefits to its membership, and how it will support the board's fiduciary duty to properly and responsibly oversee the plan.

Another key improvement that will require a perpetual review with Board oversight comes with newly established "vital signs." The key tenant is to focus on the "vital few rather than the trivial many." As a result of this new focus, a list of vital signs was established and approved by the Board that staff will report back to the Board on a periodic basis (typically quarterly or annually). A variance analysis was completed for each vital sign in order to determine an acceptable or expected outcome or range of outcomes. A stoplight analogy is used to report the outcome/measurement for each vital sign. If a vital sign measurement results in an expected outcome, it is "green." If the outcome was slightly off target, a cautionary or "yellow signal" is indicated. If an unexpected outcome or shortfall occurred, it is indicated with a "red" alert. These vital signs and their outcomes will be reviewed annually to be sure the list remains complete and represents the key metrics for oversight. Albeit a work in progress today, staff is working toward a dashboard concept that will illustrate these important measures for stakeholders so a quick glance can determine the status of the organization's vital functions.

Another important outcome of the governance project is how the Board will conduct its business, in other words, how Board and committee meetings are conducted. Going forward, meetings will focus on the powers reserved for the Board. This will improve the Board's ability to seek diversity of opinion and set unified policy; to improve the Board's line of sight into performance measurements that matter; to trust results but sufficiently verify them; and to improve the onboarding for new trustees along with ongoing education. Here again, these improvements will likely take time and experience to get right. The key is to be diligent and have resolve to see these important changes through to a successful implementation.

These important changes are timely in the context of the pandemic. These unusual times had already precipitated change in how we do business. The governance project furthered that change to make us better in all facets of the organizations' operations. This evolution is furthered by the small but mighty team of MPERS employees. Each of us takes our role and responsibility very seriously. It is important to us to carry out the work we have been given and to serve the members and other stakeholders with practical excellence.

Actuarial Funding Status:
MPERS' funding objective is to meet future benefit obligations of retirees and beneficiaries through investment earnings and payroll contributions that remain approximately level from generation to generation. Historical information relating to this objective is presented in the "Schedule of Funding Progress" in the "Actuarial Section" of this report. During the fiscal year ending June 30, 2021, the funded status of MPERS, which covers 18,660 participants, increased by 1.77% to 62.41%.

Each year an independent actuarial firm conducts a valuation study to determine the actuarial soundness of the Plan, based on its long-term obligations and the sufficiency of current contribution levels to fund the liabilities over a reasonable timeframe. In MPERS' most recent valuation dated June 30, 2020, the actuary concluded that the System continues to be financed in accordance with actuarial standards using the level percent of payroll financing method. The actuary's conclusion is based upon the fact that the employers are contributing to the System according to actuarially determined rates and presumes the continuation of payment of actuarially determined contributions. Additional information regarding the financial condition of the System can be found in the "Actuarial Section" of this report.

In an effort to address the System's underfunding situation, the Board has modified the actuarial funding policies over the course of the past 13 years. In September 2006, the Board adopted a

permanent funding policy that was intended to improve MPERS' funded status over a shorter timeframe.

The permanent funding policy states the following:

- The total contribution is based on the Plan's normal cost with a 29-year amortization period for MPERS' unfunded actuarial accrued liabilities. The financing period is a closed period that started July 1, 2007.

On September 17, 2009, after the Great Recession, the Board adopted the following temporary accelerated funding policy:

- The total contribution is based on the Plan's normal cost with a 15-year amortization period for unfunded retiree liabilities and a 30-year amortization period for other unfunded liabilities. Both amortization periods are closed periods that started July 1, 2010.
- The temporary accelerated funding policy will remain in effect until such time as the retiree liability becomes 100% funded or the permanent funding policy produces a higher contribution rate.

On September 24, 2014, the Board adopted a Rate Stabilization Reserve Fund intended to further reinforce the aggressive funding polices noted in the temporary policy above. The reserve fund was developed by maintaining employer contribution rates at present levels by applying investment gains to the reserve fund rather than decreasing employer contribution rates. When actuarial losses are experienced the reserve fund would be used first rather than increasing employer contribution rates. The reserve fund provides a smoothing of the overall experience that further decreases the potential volatility of contributions for covered employers.

As of June 30, 2021, the permanent funding policy is at a closed amortization period of 14 years and the temporary accelerated funding policy is at a closed amortization period of 3 years for unfunded retiree liabilities and 18 years for other unfunded liabilities.

Investment Activities:
State statutes and other applicable laws require the fiduciaries of the System to make investments using the same care, skill, and diligence that prudent investors acting in a similar capacity would use. In fulfilling this obligation, the Board has established a formal investment policy to clearly define the roles and responsibilities of the Board, staff and consultants, and to ensure that System assets are invested in a diversified portfolio following prudent investment standards. The Board determines the broad asset allocation policies and return objectives of the Plan. To implement and execute these policies, the Board has retained investment staff, consultants, a master custodian, and other advisors.

As of June 30, 2021, MPERS' investment portfolio had a total fair value of $3 billion, representing a return of 30.80% for the fiscal year. While MPERS' longer-term returns remain good, it was a difficult year for the portfolio. Relative to MPERS' peer group, which is the InvestorForce Public Fund Universe, the 30.80% return for Fiscal Year 2021 ranked MPERS in the 9th percentile. The trailing three- and five-year performance of 11.63% and 11.10%, respectively, ranks MPERS in the 50% and 47%, respectively, of the peer group. The trailing 10-year performance of 9.59% ranks MPERS in the top 14% of the peer group.

Awards:
The GFOA awarded a Certificate of Achievement for Excellence in Financial Reporting to MPERS for its Fiscal Year 2020 *Annual Report*. MPERS has achieved this prestigious award each year since Fiscal Year 2005. The Certificate of Achievement is the highest form of recognition for excellence in state and local government financial reporting. To be awarded a Certificate of Achievement, a government must publish an easily readable and efficiently organized *Annual Report*. This report must satisfy both generally accepted accounting principles and applicable legal and GFOA reporting requirements.

A Certificate of Achievement is valid for a period of one year. We believe that our current *Annual Report* continues to meet the program's requirements, and therefore, we are submitting this report to GFOA to determine its eligibility for another certificate.

MPERS also received the Public Pension Coordinating Council's (PPCC) Public Pension Standards Award in recognition of meeting professional standards for plan design and administration. MPERS has received the Council's award each year since 2004. This award is presented by the PPCC, a confederation of the National Association of State Retirement Administrators, the National Conference on Public Employee Retirement Systems, and the National Council on Teacher Retirement. MPERS' staff and Board is pleased to receive these prestigious awards for financial and professional standards of excellence and may be viewed after this transmittal letter.

Acknowledgements and Distribution:
This report, a product of the combined efforts of MPERS' staff and advisors, is intended to provide comprehensive and reliable information about the System, to demonstrate compliance with legal provisions, and to allow for the evaluation of responsible stewardship of the System's funds.

This report is provided to the governor, the state auditor, and the Joint Committee on Public Employee Retirement. It is also distributed electronically to all MoDOT divisions, district offices, MSHP general headquarters, and troop headquarters. These offices form the link between MPERS and its members, and their cooperation contributes significantly to the success of MPERS. We hope all readers of this report find it informative and useful. An electronic version of this report is available on the MPERS website at www.mpers.org/annual-reports.

We express our gratitude to the members of the Board, the staff, the consultants, and the many people who have worked so diligently to assure the continued successful operation of MPERS. The steady, monthly benefit payments offered by defined benefit plans, like MPERS, provide peace of mind and security for retirees and their families. For over 60 years, MPERS has been committed to providing a foundation for financial security to plan participants through the delivery of quality benefits, exceptional member service and professional plan administration.

Respectfully submitted,

Scott Simon
Executive Director

Colonel Eric T. Olsen
Board Chair

Government Finance Officers Association

Certificate of Achievement for Excellence in Financial Reporting

Presented to

Missouri Department of Transportation and Highway Patrol Employees' Retirement System

For its Comprehensive Annual Financial Report
For the Fiscal Year Ended

June 30, 2020

Christopher P. Morrill

Executive Director/CEO

PPCC

Public Pension Coordinating Council

Public Pension Standards Award
For Funding and Administration
2021

Presented to

MoDOT & Patrol Employees' Retirement System

In recognition of meeting professional standards for
plan funding and administration as
set forth in the Public Pension Standards.

Presented by the Public Pension Coordinating Council, a confederation of

National Association of State Retirement Administrators (NASRA)
National Conference on Public Employee Retirement Systems (NCPERS)
National Council on Teacher Retirement (NCTR)

Alan H. Winkle

Alan H. Winkle
Program Administrator

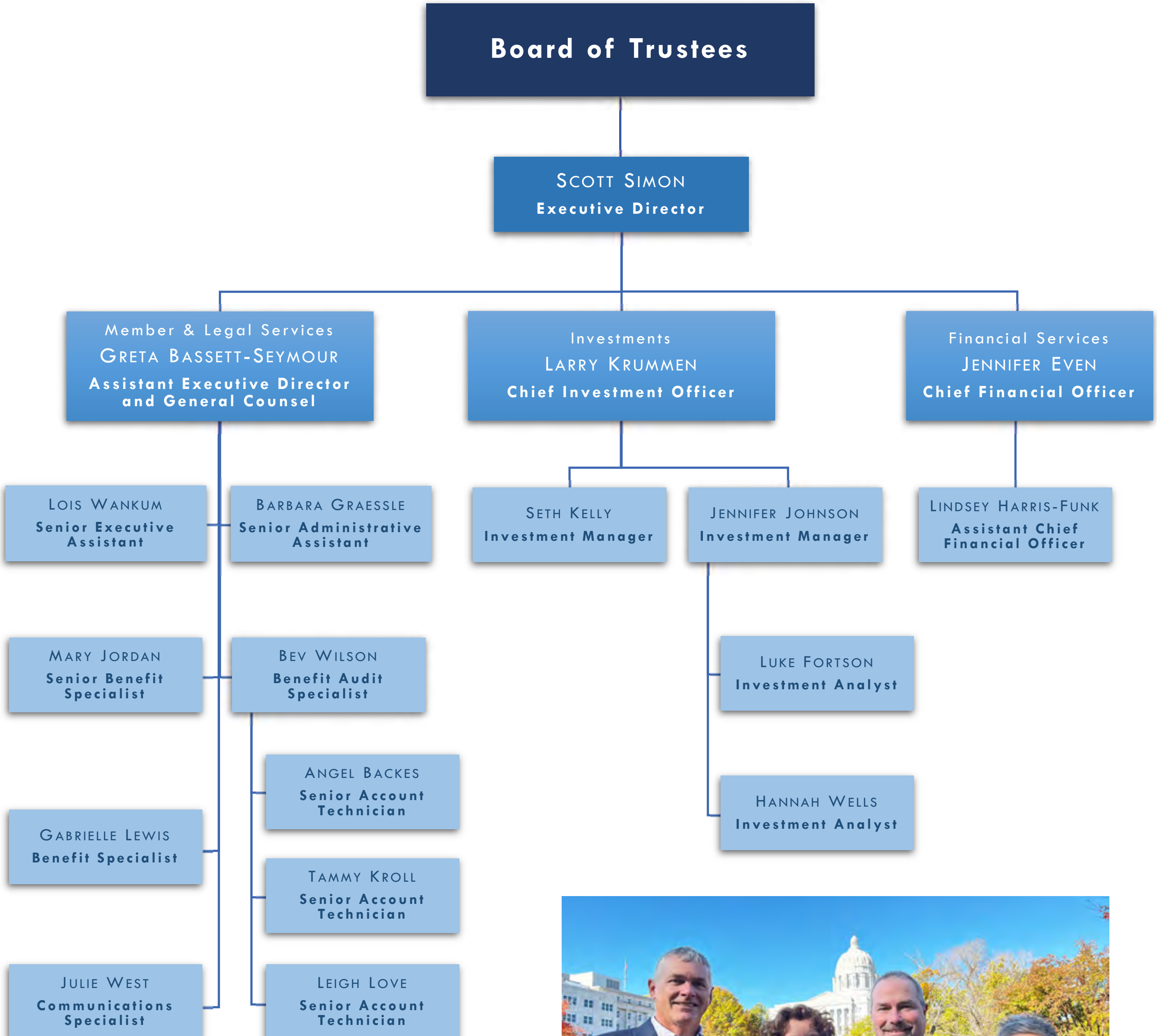
Board of Trustees

MPERS is governed by an eleven-member Board of Trustees, as set out in Section 104.160 of the Missouri Revised Statues (RSMo.). Board members as of June 30, 2021:

MPERS
Serving those who keep us safe.

Administrative Organization

The executive director of MPERS has charge of the offices and records of the System and hires such employees deemed necessary, subject to the approval of the Board of Trustees. The System employs eighteen full-time staff.



Executive Team (left to right): Scott Simon (Executive Director), Jennifer Even (Chief Financial Officer), Larry Krummen (Chief Investment Officer), Greta Bassett-Seymour (Assistant Executive Director and General Counsel)

Administrative Organization

Director's Office

The Director's Office staff provides executive oversight for the System which includes, but is not limited to, administrative support in the areas of legislation, stakeholder communications, operations, benefits, risk management, and investments. The Director's Office is also responsible for providing the Board with information and reports on the activities of the System.

Financial Services

The Financial Services section is responsible for maintaining all the financial records of MPERS. The Financial Services section interacts with the investment custodian, the auditors, the depository bank, the Missouri Department of Revenue, and the Internal Revenue Service. In addition, they assist the Investments section in tracking and predicting target cash balances, participate in annual budget development, prepare monthly budget-to-actual reports, and calculate monthly premium payments to the long-term disability insurer. The Financial Services section also processes MPERS' semi-monthly office payroll, reconciles monthly benefit payments and contributions/payrolls posted, and reconciles investment activity.

Investments

The Investments section staff works closely with the general investment consultant to manage the investment portfolio and provide consulting services to the Board and the executive director. This includes, but is not limited to: (a) formulating investment policy and asset recommendations, (b) sourcing, selecting, monitoring, and evaluating external investment advisors, (c) measuring and reporting investment performance, (d) conducting market research on political, financial, and economic developments that may affect the System, and (e) serving as a liaison to the investment community.

Legal Services

The Legal Services section advises the executive director and Board on legal matters, reviews and approves investment and other contracts for MPERS, advises staff on the application of state and federal statutes affecting the administration of plan benefits, responds to requests from members and their attorneys related to plan benefits, engages in or oversees litigation affecting MPERS, and assists in developing policies, rules, and legislation impacting MPERS' operations or the administration of plan benefits

Member Services

The Member Services section consists of two units devoted to serving member needs.

The Benefits Unit is responsible for contact with the membership regarding the benefit programs administered by MPERS, which include retirement and disability. The benefits staff is responsible for preparing and delivering the pre-retirement and benefit basics seminars in addition to assisting with the development of member communication material. The benefits staff is the main point of contact with members who have questions about their retirement.

The Payroll Unit is responsible for establishing and maintaining all membership records including: (a) maintaining member data in the pension administration system, (b) verifying retirement calculations, (c) balancing payroll deductions, (d) verifying SAMII data against exception reports, and (e) entering payroll, service, and leave data into the System's computerized database. Payroll Unit staff will also create and publish communication materials, assist with pre-retirement seminars, provide data to the actuary, as well as review member records for accuracy and completeness.

Professional Services

The following firms were retained at fiscal year-end by the Board of Trustees to serve in professional capacities or provide consultant services. Please refer to pages 48 through 51 in the Investment Section for the Schedule of Investment Expenses and Brokerage Commissions for the investment professionals.

Actuary
- Gabriel, Roeder, Smith & Company

Auditor
- Williams-Keepers, LLC

Investment General Consultant
- NEPC

Information Technology
- Levi, Ray & Shoup, Inc.
- Midwest Computech, Inc.

Legislative Consultant
- Michael G. Winter Consultants, LLC

Master Trustee/Custodian
- The Northern Trust Company

Risk Management/Insurance Consultant
- Charlesworth Benefits

Long-Term Disability Insurer
- The Standard Insurance Company

Governance Consultant
- Funston Advisory Services, LLC

Investment Managers
- Aberdeen Asset Management
- ABRY Partners
- Acadian Asset Management
- AEW Partners
- Aisling Capital
- Albourne America
- Alpstone Capital
- American Infrastructure MLP
- American Timberlands Company
- Anchorage Capital Group
- Apollo Aviation Group
- Ares Management
- Arrowroot Capital
- Banner Ridge Partners
- Blackstone
- Blue Road Capital
- Bridgewater Associates
- CarVal Investors (CVI)
- CatchMark Timber
- CBRE Investors
- Cevian Capital Limited
- CenterSquare Investment Management
- CIM Group
- Clarion Partners
- Colony Capital
- Columbia Capital
- Corrum Capital
- DC Capital
- Deephaven Capital Management
- Drive Capital
- Dyal Capital Partners
- EIF Management
- Energy & Mineral Group
- Fortress
- Francisco Partners
- Golden Sciens Marine Investments
- Grey Rock Energy Partners
- Grove Street Advisors
- GSO Capital Partners
- Heartwood Partners
- Indus Capital
- Kennedy Capital
- KPS Capital Partners
- Long Ridge Equity Partners
- Longford Capital Management
- Luxor Capital
- M&G Investments
- MGG Investment Group
- MiraVast
- Metacapital Management
- Millennium Management
- Monomoy Capital Partners
- Natural Gas Partners
- Ned Davis
- NewQuest Capital Partners
- New Mountain Capital
- Nexus Capital Management
- Northern Shipping
- Oak Street Real Estate Capital
- OCP Asia
- Opengate Capital Partners
- Orion Mine Finance Group
- Octagon Credit Investors
- Owl Rock Capital Partners
- Parametric
- Pentwater
- Pfingsten Partners
- Principal Global Investors
- Quantum Energy Partners
- Ridgewood Energy
- Riverstone Credit Partners
- Sculptor Real Estate
- Shore Capital Partners
- Shoreline Capital
- Silchester International Investors Limited
- Silver Point Capital
- Stark Investments (Shepherd)
- Stockdale Capital Partners
- Timberland Investment Resources
- Torchlight Investors
- Tristan Capital Partners
- Turnbridge Capital Partners
- Varde Asia
- Vectis Healthcare

Financial Section

The 2021 fiscal year began during the midst of a pandemic. It was a time of uncertainty. Many found themselves asking, “Will I be okay financially after the pandemic is over?”

WILLIAMS KEEPERS LLC
CERTIFIED PUBLIC ACCOUNTANTS & CONSULTANTS

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INDEPENDENT AUDITORS' REPORT

The Board of Trustees
Missouri Department of Transportation and
Highway Patrol Employees' Retirement System

Report on the Financial Statements

We have audited the accompanying statement of fiduciary net position of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (the System), as of June 30, 2021, and the related statement of changes in fiduciary net position for the year then ended, and the related notes to the financial statements, which collectively comprise the System's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with U.S. generally accepted accounting principles; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with U.S. generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the System's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the System's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the fiduciary net position of the System as of June 30, 2021, and the changes in fiduciary net position for the year then ended, in conformity with U.S. generally accepted accounting principles.

Other Matters

Required Supplementary Information

U.S. generally accepted accounting principles require that the management's discussion and analysis on pages 3 through 5 and the schedules of changes in the employers' net pension liability, employers' contributions, investment returns, changes in net OPEB liability and related ratios, MPERS' proportionate share of net OPEB liability, and related notes on pages 28 through 31 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context.

We have applied certain limited procedures to the required supplementary information in accordance with U.S. generally accepted auditing standards, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming an opinion on the financial statements that collectively comprise the System's basic financial statements. The introductory, investment, actuarial and statistical sections and the additional information presented on pages 32 through 34 are presented for purposes of additional analysis and are not a required part of the basic financial statements.

The additional information presented on pages 32 through 34 is the responsibility of management and was derived from and relate directly to the underlying accounting and other records used to prepare the basic financial statements. The additional information presented on pages 32 through 34 has been subjected to the auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with U.S. generally accepted auditing standards. In our opinion, the additional information presented on pages 32 through 34 is fairly stated in all material respects in relation to the basic financial statements as a whole.

The introductory, investment, actuarial and statistical sections have not been subjected to the auditing procedures applied in the audit of the basic financial statements and, accordingly, we do not express an opinion or provide any assurance on them.

Williams-Keepers LLC

November 5, 2021

The management of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (the System, or MPERS) provides this discussion and analysis of the System's financial performance for the fiscal year ended June 30, 2021. While this discussion is intended to summarize the financial status of MPERS, readers should consider this information in conjunction with the information that is furnished in the more detailed financial statements and corresponding notes.

DESCRIPTION OF BASIC FINANCIAL STATEMENTS

As required by the Governmental Accounting Standards Board (GASB) accounting standards, this financial report consists of Management's Discussion and Analysis (this section), the basic financial statements (including notes to the basic financial statements), and other required supplementary information.

Financial Statements report information about MPERS, using accounting methods similar to those used by private-sector companies, by using the economic resources measurement focus and accrual basis of accounting. These statements provide both long-term and short-term information about the System's overall financial status. These statements follow this Management's Discussion and Analysis section:

- The *Statement of Fiduciary Net Position* includes all the System's assets and deferred outflows of resources, and liabilities and deferred inflows of resources, with the difference reported as net position.
- The *Statement of Changes in Fiduciary Net Position* accounts for all the current year's additions (income) and deductions (expenses), regardless of when cash is received or paid.

Notes to the Financial Statements are included following the financial statements. The notes to the financial statements provide additional information that is essential for a full understanding of the data provided in the financial statements.

Required Supplementary Information follows the notes and further supports the information in the financial statements.

Supplementary Information follows the required supplementary information and provides additional detailed administrative and investment expense information.

ANALYSIS OF FINANCIAL POSITION AND RESULTS OF OPERATIONS

Overall, the financial position of MPERS increased by $642.3 million, reported as the "net increase". This is primarily a result of the increase in the fair value of investments for the year ended June 30, 2021. The funded status of the plan showed an increase of 1.77%, primarily due to the positive investment returns.

The following schedules present summarized comparative data from the System's financial statements for each of the fiscal years ended June 30, 2021 and 2020. Following each schedule is a brief summary providing explanation and analyses of the major reasons for changes in the condensed financial statements.

Summarized Comparative Statements of Fiduciary Net Position

	As of June 30, 2021	As of June 30, 2020	% Change 2021 / 2020
Cash and Receivables	$ 27,488,024	$ 19,630,328	40.0
Investments	3,002,537,498	2,352,666,839	27.6
Invested Securities Lending Collateral	117,448,756	108,567,739	8.2
Capital Assets	383,217	321,676	19.1
Total Assets	**3,147,857,495**	**2,481,186,582**	**26.9**
Deferred Outflows of Resources	**361,851**	**31,054**	**1,065.2**
Accounts Payable	19,344,757	2,868,289	574.4
OPEB Obligation	2,019,603	1,552,393	30.1
Securities Lending Collateral	122,747,636	114,948,267	6.8
Total Liabilities	**144,111,996**	**119,368,949**	**20.7**
Deferred Inflows of Resources	**182,122**	**248,799**	**-26.8**
Net Position Restricted for Pensions	**$ 3,003,925,228**	**$ 2,361,599,888**	**27.2**

The increase in cash and receivables is primarily attributable to an increase of investment sales receivable as of June 30, 2021. Fluctuations in this area are normal, based on investment activity.

The System's investments represent the main component of total assets. These investments include equities, fixed income, limited partnerships, hedge funds, and short-term investments. The increase in fair value of investments as of June 30, 2021, is due to the strong investment performance during the fiscal year. The fiscal year 2021 investment return was 30.80% as calculated on a time-weighted rate of return methodology.

Capital assets increased in fiscal year 2021 due to the purchase of a parcel of land adjacent to the MPERS office.

Deferred outflows of resources are related to Other Post-Employment Benefits (OPEB), required by Governmental Accounting Standards Board (GASB) Statement 75. The deferred outflows of resources relate to the timing of contributions paid and changes in assumptions.

The increase in accounts payable for fiscal year 2021 is primarily attributable to higher investment purchases payable. Fluctuations in this area are normal, based on investment activity.

The largest component of liabilities is securities lending collateral. This represents the amount owed for collateral to be returned as the result of investment securities lent. The increase in securities lending collateral liability from fiscal year 2020 to fiscal year 2021 is due to more securities being utilized for lending. The corresponding securities lending collateral asset is valued at a lower amount than the securities lending collateral liability due to the fair value of the securities on loan being less than the collateral value.

Deferred inflows of resources are related to OPEB. The deferred inflows of resources relate primarily to the amortization of changes in actuarial assumptions.

The System's net position restricted for pensions was $3.004 billion at June 30, 2021, a $642.3 million increase from the $2.362 billion net position at June 30, 2020.

Summarized Comparative Statements of Changes in Fiduciary Net Position

	Year Ended June 30, 2021	Year Ended June 30, 2020	% Change 2021 / 2020
Contributions	$ 217,389,127	$ 220,902,777	-1.6
Net Investment Income (Loss)	699,644,251	(10,673,270)	6,655.1
Other Income	286	5,412	-94.7
Total Additions	**917,033,664**	**210,234,919**	**336.2**
Benefits	270,122,851	267,605,833	0.9
Administrative Expenses	4,585,473	4,291,028	6.9
Total Deductions	**274,708,324**	**271,896,861**	**1.0**
Net Increase (Decrease)	642,325,340	(61,661,942)	1,141.7
Net Position – Beginning	2,361,599,888	2,423,261,830	-2.5
Net Position – Ending	**$3,003,925,228**	**$2,361,599,888**	**27.2**

Net investment income, a primary component of plan additions, was $699.6 million for fiscal year 2021, which represented a 30.80% return for the fiscal year ended June 30, 2021. In comparison, the fiscal year 2020 loss of $10.7 million represented an investment return of negative 0.46%. Annual fluctuations within the broad investment markets are outside the control of the System and are expected to fluctuate from year to year; however, fiscal year 2021 was an exceptional year as markets recovered from the losses incurred during the onset of the COVID-19 pandemic. The Board of Trustees has approved a diversified asset allocation that, over long periods of time, is expected to realize the assumed actuarial rate of investment return of 6.50%.

Total benefits increased $2.5 million from 2020 to 2021. Benefits in 2021 increased due to an increase in the total number of retirees.

The increase in administrative expenses is due to higher personal services and related benefit expenses that are a result of the strong investment returns in fiscal year 2021.

CURRENTLY KNOWN FACTS AND RECENT EVENTS

Based on the June 30, 2021 actuarial valuation, the Board of Trustees approved an increase to the required state contribution rate for uniformed patrol of 58.65%, effective July 1, 2022. The rate applied to non-uniformed payroll (MoDOT, civilian patrol, and MPERS) remains at 58.00%.

Based on the June 30, 2020 actuarial valuation, the Board of Trustees approved no change in the required state contribution rate, effective July 1, 2021. The rate applied to both non-uniformed payroll (MoDOT, civilian patrol, and MPERS) and uniformed patrol payroll remains at 58.00%.

CONTACTING THE RETIREMENT SYSTEM'S MANAGEMENT

This financial report is designed to provide a general overview of the System's finances. Questions about this report or requests for additional financial information should be sent to:

MoDOT and Patrol Employees' Retirement System
PO Box 1930
Jefferson City, MO 65102-1930
mpers@mpers.org

Statement of Fiduciary Net Position

As of June 30, 2021

ASSETS	
Cash	$ 428,926
Receivables	
Contributions	8,858,776
Accrued Interest and Income	4,808,672
Investment Sales	13,388,650
Other	3,000
Total Receivables	27,059,098
Investments, at Fair Value	
Equities	446,097,367
Fixed Income	639,560,365
Limited Partnerships	1,223,937,373
Hedge Funds	108,412,343
Short-Term Investments	584,530,050
Total Investments	3,002,537,498
Invested Securities Lending Collateral	117,448,756
Capital Assets, Net of Depreciation	
Land	159,293
Building and Improvements	581,618
Furniture, Equipment, and Software	3,438,789
Accumulated Depreciation	(3,796,483)
Capital Assets, Net of Depreciation	383,217
TOTAL ASSETS	**$ 3,147,741,574**
DEFERRED OUTFLOWS OF RESOURCES	**$ 361,851**
LIABILITIES	
Accounts Payable	$ 1,599,714
OPEB Obligation	2,019,603
Security Lending Collateral	122,747,636
Investment Purchases	17,745,043
TOTAL LIABILITIES	**$ 144,111,996**
DEFERRED INFLOWS OF RESOURCES	**$ 182,122**
NET POSITION RESTRICTED FOR PENSIONS	**$ 3,003,925,228**

See accompanying Notes to the Financial Statements.

Statement of Changes in Fiduciary Net Position

For the Year Ended June 30, 2021

ADDITIONS	
Contributions	
Employer	$ 208,212,848
Employee	5,334,102
Service Transfers from Other System	2,080,317
Other	1,761,860
Total Contributions	217,389,127
Investment Income from Investing Activities	
Net Appreciation in Fair Value of Investments	721,374,058
Interest and Dividends	52,743,498
Investment Expenses	(74,603,960)
Net Investment Gain	699,513,596
Income from Securities Lending Activities	
Securities Lending Gross Income	196,742
Securities Lending Expenses, net	(66,087)
Net Income from securities Lending Activities	130,655
Other Income	286
TOTAL ADDITIONS	**$ 917,033,664**
DEDUCTIONS	
Benefits Expenses	
Retiree and Survivor Annuity Benefits	$ 250,420,018
BackDROP Payments	13,585,357
Disability Benefits	2,448,444
Death Benefits	1,255,000
Service Transfer Payments	1,802,900
Employee Contributions Refunds	611,132
Total Benefits Expenses	270,122,851
Administrative Expenses	4,585,473
TOTAL DEDUCTIONS	**$ 274,708,324**
NET INCREASE	$ 642,325,340
NET POSITION RESTRICTED FOR PENSIONS	
Beginning of Year	**$ 2,361,599,888**
End of Year	**$ 3,003,925,228**

See accompanying Notes to the Financial Statements.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

As established under Section 104.020 of the Revised Statutes of Missouri (RSMo.), the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS) is a body corporate and an instrumentality of the State of Missouri (State). Due to the nature of MPERS' reliance on funding from the Missouri Department of Transportation (MoDOT) and the Missouri State Highway Patrol (MSHP) and control of the overall plan document by the legislative and executive branches of state government, MPERS is considered a part of the State of Missouri financial reporting entity and is included in the State's financial reports as a component unit shown as a pension trust fund.

Note 1 (a) - Basis of Accounting

The financial statements were prepared using the accrual basis of accounting. Contributions are due to MPERS when employee services have been performed. Contributions are recognized as revenues when due, pursuant to statutory requirements. Benefits are recognized when due and payable and expenses are recorded when the corresponding obligations are incurred. Dividend income is recognized when dividends are declared. Interest income is recognized when earned.

Note 1 (b) - Method Used to Value Investments

Investments are reported at fair value on a trade date basis. Bonds and stocks traded on a national or international exchange are valued at the reported sales price at current exchange rates. Mortgages are valued on the basis of future principal and interest payments and are discounted at prevailing interest rates for similar instruments. The fair value of real estate and timber investments are based on net asset value estimates provided by the general partners' administrators or portfolio managers, which are compared to independent appraisals. Investments that do not have an established market are reported at estimated fair value. The fair value of the hedge fund portfolios and partnership portfolios are based on valuations of the underlying assets as reported by the general partner or portfolio manager.

Note 1 (c) - Net Investment in Capital Assets

MPERS capitalizes assets with an expected useful life greater than one year and a cost greater than $5,000. Capital assets are depreciated on the straight-line method over the estimated useful lives of the related assets. The estimated useful lives are as follows:

Furniture, Equipment and Software	3-10 years
Building and Improvements	30 years

Note 1 (d) - Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

NOTE 2 – PLAN DESCRIPTIONS AND CONTRIBUTION INFORMATION

MPERS is a body corporate and an instrumentality of the state as a multiple-employer, public employee retirement system with one plan that has three benefit structures known as the Closed Plan, the Year 2000 Plan, and the Year 2000 Plan-2011 Tier. The plan provides retirement, survivor, and disability benefits for employees of MoDOT, MSHP, and MPERS. The plan is administered in accordance with the requirements of a cost sharing, multiple-employer, public employee retirement plan under the Revised Statutes of Missouri. In MPERS are vested the powers and duties specified in sections 104.010 to 104.312, 104.601 to 104.805, and 104.1003 to 104.1093, RSMo., and such other powers as may be necessary or proper to enable it, its officers, employees, and agents to carry out fully and effectively all the purposes outlined pursuant to these sections. Responsibility for the operation and administration of the System is vested in the Board of Trustees, which consists of eleven members, four elected by the active and retired plan members, three Highway and Transportation Commissioners, a State Senator appointed by the President pro tem of the Senate, a State Representative appointed by the Speaker of the House, and the MoDOT Director and MSHP Superintendent who serve as ex-officio members. Detailed information regarding contributions can be found in Note 5.

Generally, all covered employees hired before July 1, 2000, are eligible for membership in the Closed Plan. All covered employees hired on or after July 1, 2000, and before January 1, 2011, are eligible for membership in the Year 2000 Plan. All covered employees hired on or after January 1, 2011, are eligible for membership in the Year 2000 Plan's 2011 Tier.

Membership in the Closed Plan, Year 2000 Plan, and 2011 Tier as of June 30, 2021

	Closed	Year 2000	Tier 2011	Total
Retirees, Beneficiaries, and Disabilities Currently Receiving Benefits	4,852	4,407	32	9,291
Terminated Employees Entitled to But Not Yet Receiving Benefits	989	974	190	2,153
Active Employees				
Vested	1,748	2,116	1,192	5,056
Non-Vested	2	45	2,091	2,138
Total Membership	**7,591**	**7,542**	**3,505**	**18,638**

Closed Plan Description

Employees covered by the Closed Plan are fully vested for benefits upon receiving 5 years of creditable service. Under the Closed Plan, MoDOT and civilian employees may retire with full benefits upon the earliest of attaining:

- Age 65 with 4 or more years of creditable service (active);
- Age 65 with 5 or more years of creditable service (terminated & vested);
- Age 60 with 15 or more years of creditable service (active or terminated & vested); or
- "Rule of 80" – at least age 48 with sum of member's age and service equaling 80 or more (active or terminated & vested).

The following provisions apply for uniformed patrol members of the Closed Plan:

- Age 55 with 4 or more years of creditable service (active);
- Age 55 with 5 or more years of creditable service (terminated & vested);
- "Rule of 80" – at least age 48 with sum of member's age and service equaling 80 or more (active or terminated & vested); or
- Mandatory retirement at age 60 (active).

All non-uniformed members may retire early, with reduced benefits, at age 55 with at least 10 years of creditable service.

The base benefit in the Closed Plan is equal to 1.6% multiplied by the final average pay multiplied by years of creditable service. For members of the uniformed patrol, the base benefit is calculated by applying the same formula, then multiplying the product by 1.333333.

Retired uniformed members will receive an additional benefit of $90 per month, plus cost-of-living adjustments (COLAs), until attainment of age 65. This payment, however, is reduced by any amount earned during gainful employment. This benefit is not available to uniformed members hired on or after January 1, 1995, or to vested deferred members.

For members employed prior to August 28, 1997, COLAs are provided annually based on 80% of the increase in the consumer price index for all urban consumers for the United States (CPI-U). The minimum rate is 4% and the maximum rate is 5%, until the cumulative amount of COLAs equals 65% of the original benefit. Thereafter, the 4% minimum rate is eliminated, and the annual COLA rate will be equal to 80% of the increase in the CPI-U (annual maximum of 5%). For members employed on or after August 28, 1997, COLAs are provided annually based on 80% of the increase in the CPI-U, up to a maximum rate of 5%.

The BackDROP is a payment option that is available to eligible members upon retirement. This option provides for a benefit to be calculated as if the member elected to retire at a previous date. If the BackDROP is elected, the monthly benefit payable on the actual retirement date is based on the benefit that would have been received by the member had he/she left employment and retired on the BackDROP date. In addition, the member will receive a lump sum payment equal to 90% of the life income annuity amount the member would have received during the BackDROP period. This lump sum amount includes any COLAs and other benefit increases; also, credit will be received for the unused sick leave balance as of the date of retirement.

The life income annuity payment option (which contains no provision for survivorship) and the life income with 60 or 120 month guaranteed payment options are available to all members. Joint and 50% or 100% survivor options are available if married at the time of retirement. In the Closed Plan, the reduction for the joint & 100% survivor option is based on the difference between the age of the member and the survivor. There is no reduction for the joint and 50% survivor option.

If a reduced joint and survivor option is chosen at the time of retirement and the spouse precedes the member in death, the benefit will revert back (pop-up) to a normal annuity, upon appropriate notification to MPERS.

Members may name a new spouse as beneficiary if:

- They were single at retirement and since married;
- They elected a spouse option at the time of retirement, the spouse preceded the member in death, and then a remarriage occurred.

The member has 1 year from the date of marriage to re-elect a payment option and name a new spouse.

All members who retire from active employment or long-term disability, or begin receiving normal or work-related disability benefits, on or after September 28, 1985, are provided a $5,000 death benefit payable to designated beneficiaries.

Year 2000 Plan Description

Employees covered by the Year 2000 Plan are fully vested for benefits upon earning 5 years of creditable service. Under the Year 2000 Plan, MoDOT and civilian employees may retire with full benefits upon the earliest of attaining:

- Age 62 and with 5 or more years of creditable service (active or terminated & vested);
- “Rule of 80” – at least age 48 with sum of member’s age and service equaling 80 or more (active).

The following provisions apply for uniformed patrol members of the Year 2000 Plan:

- “Rule of 80” – at least age 48 with sum of member’s age and service equaling 80 or more (active);
- Mandatory retirement at age 60 (active only).

All members may retire early with reduced benefits at age 57 with at least 5 years of creditable service.

The base benefit in the Year 2000 Plan is equal to 1.7% multiplied by the final average pay multiplied by years of creditable service. Members retiring under the Rule of 80, and uniform patrol members retiring at the mandatory retirement age (currently 60), receive an additional temporary benefit until age 62. The temporary benefit is equivalent to 0.8% multiplied by final average pay multiplied by years of creditable service.

COLAs are provided annually based on 80% of the increase in the CPI-U, up to a maximum rate of 5%.

The BackDROP is a payment option that may be available to members upon retirement. This option provides for a monthly benefit to be calculated as if the member elected to retire at a previous date. If the BackDROP is elected, the monthly benefit payable on the actual retirement date is based on the benefit that would have been received by the member had he/she left employment and retired on the BackDROP date. In addition, the member will receive a lump sum payment equal to 90% of the life income annuity amount the member would have received during the BackDROP period. This lump sum amount includes any temporary benefits, COLAs, and other benefit increases; also, credit will be received for the unused sick leave balance as of the date of retirement.

The life income annuity payment option (with no provision for survivorship) and the life income with 120 or 180 months guaranteed payment options are available to all members. Joint and 50% or 100% survivorship options are available if married at the time of retirement. The reduction for the joint and 50% or 100% survivor options is based on the member’s age at retirement, as well as the age difference between the member and the survivor.

If a reduced joint and survivor option is chosen at the time of retirement and the spouse precedes the member in death, the benefit will revert back (pop-up) to a normal annuity, upon appropriate notification to MPERS.

Members may name a new spouse for survivor benefits if:
- They were single at retirement and since married;
- They elected a spouse option at the time of retirement, the spouse preceded the member in death, and then a remarriage occurred.

The member has 1 year from the date of marriage to re-elect the payment option and name a new spouse.

All members who retire from active employment or long-term disability, or begin receiving work-related disability benefits, on or after July 1, 2000, are provided a $5,000 death benefit payable to designated beneficiaries.

Year 2000 Plan-2011 Tier Description
Employees covered by the 2011 Tier are fully vested for benefits upon earning 5 years of creditable service if they were active on or after January 1, 2018. Under the 2011 Tier, MoDOT and civilian employees may retire with full benefits upon the earliest of attaining:
- Age 67 and with 5 or more years of creditable service (active or terminated & vested);
- "Rule of 90" – at least age 55 with sum of member's age and service equaling 90 or more (active only).

Active MoDOT and civilian employees may retire early with reduced benefits at age 62 with at least 5 years of creditable service. The following provisions apply for uniformed patrol members of the 2011 Tier:
- Age 55 and with 5 or more years of creditable service (active only);
- Mandatory retirement at age 60 with no minimum service amount (active only).

Terminated and vested uniformed patrol employees may retire at age 67 with 5 or more years of creditable service.

The base benefit in the 2011 Tier is equal to 1.7% multiplied by the final average pay multiplied by years of creditable service. Members retiring under the Rule of 90, and uniform patrol members retiring at the mandatory retirement age (currently 60) or at age 55 with 5 years of creditable service, receive an additional temporary benefit until age 62. The temporary benefit is equivalent to 0.8% multiplied by final average pay multiplied by years of creditable service.

COLAs are provided annually based on 80% of the change in the CPI-U, up to a maximum rate of 5%.

The life income annuity payment option (with no provision for survivorship) and the life income with 120 or 180 months guaranteed payment options are available to all members. Joint and 50% or 100% survivorship options are available if married at the time of retirement. The reduction for the joint and 50% or 100% survivor options is based on the member's age at retirement, as well as the age difference between the member and the survivor.

If a reduced joint and survivor option is chosen at the time of retirement and the spouse precedes the member in death, the benefit will revert back (pop-up) to a normal annuity, upon appropriate notification to MPERS.

Members may name a new spouse for survivor benefits if:
- They were single at retirement and since married;
- They elected a spouse option at the time of retirement, the spouse preceded the member in death, and then a remarriage occurred.

The member has 1 year from the date of marriage to re-elect the payment option and name a new spouse.

All members who retire from active employment or long-term disability, or begin receiving work-related disability benefits, on or after January 1, 2011, are provided a $5,000 death benefit payable to designated beneficiaries.

Contributions

Beginning January 1, 2011, employee contributions of 4% of gross pay are required for those covered by the Year 2000 Plan-2011 Tier.

Employer contributions are determined through annual actuarial valuations. Administrative expenses are financed through contributions from participating employers and investment earnings.

Participating employers are required to make contributions to the plan based on the actuarially determined rate. Detailed information regarding contributions can be found in Note 5.

NOTE 3 – DEPOSITS AND INVESTMENTS

The Board of Trustees has established policies and procedures by which funds are invested. Section 104.150, RSMo., provides the authority for the Board to invest MPERS funds. Plan assets are invested in a diversified portfolio following prudent standards for preservation of capital, with the goal of achieving the highest possible rate of return consistent with MPERS' tolerance for risk. The Board of Trustees establishes MPERS' asset allocation policy and may amend the policy. The following is MPERS' current asset allocation policy:

Asset Class	Target Allocation
Public Equity	40.0%
Private Equity	10.0%
Traditional Fixed Income	22.5%
Opportunistic Debt	7.5%
Real Assets	10.0%
Real Estate	10.0%
Cash	0.0%

Note 3 (a) - Deposit and Investment Risk Policies

Concentration of Credit Risk

Concentration of credit risk is the risk of loss attributed to the magnitude of the System's investment in a single issuer. Within the traditional asset classes (equities and fixed income), the consultant will aggregate exposures across asset classes to create measures of concentration including industries, countries, and security issuer for Investment staff review.

Investment Custodial Credit Risk

Custodial credit risk is an investment risk that, in the event of the failure of the counterparty to a transaction, the System will not be able to recover the value of its investment or the collateral securities that are in the possession of an outside party. Investment securities are exposed to custodial credit risk if the securities are uninsured, are not registered in the name of the System, and are held by either: a) the counterparty or b) the counterparty's trust department or agent but not in the System's name. It is the policy of the System to require that all investments be clearly marked as to ownership and, to the extent possible, shall be registered in the name of the System.

Cash Deposit Custodial Credit Risk

Cash deposit custodial credit risk is the risk that, in the event of the failure of depository financial institution, the System will not be able to recover deposits or will not be able to recover collateral securities that are in the possession of an outside party. Missouri state law requires that all public funds must be collateralized with acceptable securities having fair values of at least 100% of the amount of funds on deposit (less any amount covered by FDIC insurance).

Market Risk

Market risk is the risk that the fair value of an investment will be adversely impacted due to a change in value of the underlying market. The three primary market risks prevalent in the System's investment portfolio are equity prices, interest rates, and foreign currencies. Equity risk is the risk that stock prices fall and/or the volatility in the equity market increases. Interest rate risk is the risk

that fixed income securities (or any investment primarily valued on a yield basis) will drop in value due to an increase in interest rates. Currency risk is the risk that changes to foreign exchange rates will adversely impact the fair value of non-U.S. Dollar denominated assets. The System protects the portfolio against market risks by adopting a diversified asset allocation that limits the amount of exposure to each underlying market risk. Market risks are also controlled by monitoring the types, amounts, and degree of risk that each investment manager takes for their specific mandate.

Investment Credit Risk

Investment credit risk is the risk that an issuer or other counterparty to an investment will not fulfill its obligations. Unless authorized under a separate Investment Management Agreement or operating agreement, it is the policy of the System to limit fixed income managers to purchasing securities that possess a minimum credit rating of "Baa" by Moody's and "BBB" by Standard & Poor's. Issues subsequently downgraded below these ratings must be brought to the attention of the Chief Investment Officer. Where counterparty risk is present, the System's investment managers seek to control credit risk through counterparty credit evaluations and approvals, counterparty credit limits and exposure monitoring procedures.

Note 3 (b) - Cash Deposits

Cash balances include short-term securities held by the custodial bank to meet future obligations and operating balances held by the depository bank. As of June 30, 2021, MPERS had a carrying amount of deposits of $(325,862), and a bank balance of $16. The FDIC covered the bank balances. To maximize investment income, cash is invested in overnight repurchase agreements, thus causing the negative cash amount disclosed above. The balances in these repurchase agreements on June 30, 2021 totaled $754,788. As of June 30, 2021, no investments were held as repurchase agreements that were uninsured or unregistered, with securities held by the counterparty or by its trust department or agent but not in MPERS' name.

Note 3 (c) – Concentrations

No investments in any one organization (other than those issued or sponsored by the U.S. government and those in pooled investments) represent 5% of plan net position.

Note 3 (d) – Rate of Return

For the year ended June 30, 2021, the annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was 30.79%. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

Note 3 (e) – Investments

The following table shows MPERS' investments by type.

Summary of Investments by Type as of June 30, 2021

	Carrying Amount	Fair Value
Equities	$ 227,541,615	$ 446,097,367
Fixed Income	618,177,137	639,560,365
Limited partnerships	1,118,507,607	1,223,937,373
Hedge	65,168,948	108,412,343
Short Term Securities	585,284,838	585,284,838
Securities Lending Collateral	117,448,756	117,448,756
Total Investments	**$2,731,374,113**	$3,120,741,042
Reconciliation to Statement of Fiduciary Net Position:		
Less: Repurchase Agreements		(754,788)
Less: Securities Lending Collateral		(117,448,756)
Investments per Statement of Fiduciary Net Position		**$3,002,537,498**

Certain investments are not listed on national exchanges, over-the-counter markets, nor do they have quoted market prices. Their valuation is based on the most current net asset values, independent appraisals, and/or good faith estimates of the investment's fair value provided by the general partner or portfolio manager, cash flow adjusted through fiscal year end. The estimated fair value of these investments may differ significantly from values that would have been used had a ready market existed. The following investments were priced using those methods and comprised 44.37% of the total fair value of the System's investments as of June 30, 2021:

	Fair Value
Hedge Funds	$ 108,412,343
Limited Partnerships	1,223,937,373
	$1,332,349,716

Note 3 (f) – Fair Value Measurements
MPERS categorizes its fair value measurements within the fair value hierarchy established by generally accepted accounting principles. The hierarchy is based on the valuation inputs used to measure the fair value of the asset and give the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (level 1 measurements) and the lowest priority to unobservable inputs (level 3 measurements).

Level 1: Unadjusted quoted prices for identical instruments in active markets.

Level 2: Quoted prices for similar instruments in active markets; quoted prices for identical or similar instruments in markets that are not active; and model-derived valuations in which all significant inputs are observable.

Level 3: Values derived from valuation techniques in which significant inputs are unobservable. Investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient are not classified in the fair value hierarchy.

Investments Measured at Fair Value, June 30, 2021

Investments by Fair Value Level	**Fair Value**	**Level 1**	**Level 2**	**Level 3**
Short Term Securities	$ 567,457,290	$567,457,290	$ 0	$ 0
Debt Securities				
Collateralized Debt Obligations	254,315,047	0	96,655,147	157,659,900
Commercial Mortgage-Backed Securities	37,667,655	0	28,925,422	8,742,233
Corporate Bonds	1,267,340	0	1,267,340	0
Government Commercial Mortgage-Backed Securities	10,963,276	0	22,115	10,941,161
Government Mortgage-Backed Securities	22,775,497	0	18,552,005	4,223,492
Municipal Bonds	150,014,371	0	79,350,406	70,663,965
U.S. Government Agencies	74,544,469	0	74,544,469	0
U.S. Treasury Securities	66,708,152	0	66,708,152	0
Total Debt Securities	618,255,807	0	366,025,056	252,230,751
Equity Securities				
Communication Services	1,151,402	1,151,402	0	0
Consumer Discretionary	6,523,710	6,523,710	0	0
Consumer Staples	3,504,267	3,504,267	0	0
Energy	200,730	200,730	0	0
Equity Other	32,323,105	32,323,105	0	0
Financials	53,375,349	53,151,573	223,776	0
Health Care	5,439,057	5,439,057	0	0
Industrials	6,329,905	6,329,905	0	0
Information Technology	8,788,901	8,788,901	0	0
Materials	380,803	380,803	0	0
Real Estate	13,267,423	13,267,423	0	0
Utilities	860,931	860,931	0	0
Total Equity Securities	132,145,583	131,921,807	223,776	0
Private Markets				
Private Equity	477,536,803	0	0	477,536,803
Real Estate	132,861,937	(56)	0	132,861,993
Real Assets	333,377,752	(422,639)	0	333,800,391
Opportunistic Debt	310,913,595	41,423,860	0	269,489,735
Total Private Markets	1,254,690,087	41,001,165	0	1,213,688,922
Investment Derivative Instruments				
Equity Swaps	(1,793,670)	0	(1,793,670)	0
Total Investment Derivative Instruments	(1,793,670)	0	(1,793,670)	0
Total Investment by Fair Value Level	$2,570,755,097	**$740,380,262**	**$364,455,162**	**$1,465,919,673**
Investments Measured at Net Asset Value				
Commingled International Equity Fund	274,577,163			
Equity Long/Short	19,691,391			
Event	17,475,869			
Global Asset Allocation	29,580,474			
In-Liquidation	988,098			
Multi-Strategy	19,374,349			
Structured Credit - Relative Value	1,292,751			
Private Real Estate Fund	69,098,528			
Total Investments Measured at Net Asset Value	432,078,623			
Total Investments	**$3,002,833,720**			
Reconciliation to Statement of Fiduciary Net Position				
Total Investments Measured at Fair Value and Derivatives	$3,002,833,720			
Investment Sales Receivable	(13,388,650)			
Investment Purchases Payable	17,745,043			
Accrued Interest and Income	(4,808,672)			
Accrued Expenses	156,057			
Total Investments per Statement of Fiduciary Net Position	**$3,002,537,498**			

Investments listed as level 1 include equity securities and futures contracts where the price comes from an exchange.

Investments listed as level 2 include debt securities where an independent pricing evaluator had direct observable information including: trading volume, multiple sources of market data and benchmark spreads. The equity index swap is included because the valuation inputs include an observable interest rate and the underlying index.

Investments listed as level 3 include debt securities where an independent pricing evaluator did not have direct observable information and had limited market information for comparable securities. Significant inputs used in the valuation are not available aside from the evaluator providing the price. Direct investments in private equity, real estate, credit, and real assets are included because the valuation techniques utilize discounted cash flows or other non-observable market information by manager.

Private Markets Measured at Fair Value as of June 30, 2021

Private Markets	Fair Value	Unfunded Commitments
Private Equity	$ 477,536,803	$122,195,641
Real Estate	132,861,937	102,004,470
Real Assets	333,377,752	112,840,248
Opportunistic Debt	310,913,595	232,133,151
Total Private Markets	**$1,254,690,087**	**$569,173,510**

Private Markets

Private equity, real estate, real assets, and opportunistic debt are the four asset classes that fall into the category of private market funds. These funds invest in the equity or debt of private companies.

Private Equity: The private equity portfolio includes 26 direct fund investments and three fund of fund investments. These funds mostly invest in private companies adding value through operational or industry expertise and vast networks. The majority of the private equity allocation is in buyout funds with a smaller portion in venture capital and growth equity funds. These funds are not eligible for redemption. Distributions are received as underlying investments within the funds are liquidated, which on average can occur over the span of six to ten years.

Real Estate: The real estate portfolio consists of 26 real estate funds. The noncore real estate book includes 22 real estate funds that invest in value-add or opportunistic strategies. These funds are not eligible for redemption. Distributions are received as underlying investments within the funds are liquidated, which on average can occur over the span of six to ten years. The remaining four investments are in core real estate funds. Three of these funds are open-ended. Two are eligible for redemption on a quarterly basis and one on a daily basis.

Real Assets: The real asset portfolio contains 30 funds that invest in private energy, aviation, mining, and shipping companies. The timber portfolio, which includes both ownership in timber funds and direct timber investments, is also within the real assets portfolio. The timber portfolio has 12 direct timber investments. These funds and investments are not eligible for redemption. Distributions are received as underlying investments and investments within the funds are liquidated, which on average can occur over the span of six to ten years.

Opportunistic Debt: The opportunistic debt portfolio, comprised of 34 funds, provide financing to various companies. While this portfolio has a U.S. bias, some funds invest internationally with exposures in Europe and Asia. These funds are not eligible for redemption. Distributions are received as underlying investments within the funds are liquidated, which on average can occur over the span of three to five years.

Investments Measured at Net Asset Value as of June 30, 2021

Investments at Net Asset Value	Net Asset Value	Unfunded Commitments	Redemption Frequency (If Currently Eligible)	Redemption Notice Period
Hedge Funds				
Equity Long/Short	$ 19,691,391	$ 0	Quarterly	45 days
Event Driven	17,475,869	0	Monthly	90 days
Global Asset Allocation	29,580,474	0	Monthly	5-60 days
In-Liquidation	988,098	0	In Liquidation	
Multi-Strategy	19,374,349	0	Monthly	60-90 days
Structured Credit – Relative Value	1,292,751	0	Quarterly	60 days
Total Hedge Funds	88,402,932	0		
Commingled International Equity Funds	274,577,163	0	Daily, Monthly	0-30 days
Private Real Estate Funds	69,098,528	0	Daily	90 days
Total Investments at Net Asset Value	**$432,078,623**	**$ 0**		

Hedge Funds

Equity Long/Short: Consisting of one fund, this strategy invests in both long and short in Asia Pacific equity securities, with a goal of adding growth and minimizing market exposure. Due to contractual lock-up restrictions, the value of these investments is eligible for redemption in the next six months.

Event Driven: Consisting of one fund, this strategy seeks to gain an advantage from pricing inefficiencies that may occur at the onset or aftermath of a merger, corporate action, or related event. Due to contractual lock-up restrictions, the value of this fund is eligible for redemption in the next four months.

Global Asset Allocation: Consisting of one fund, this strategy is highly diversified and uses fundamental research to develop systematic rules for trading positions. Due to contractual lock-up restrictions, the value of this fund is eligible for redemption in the next 35 days.

Hedge Funds in Liquidation: MPERS currently has a small investment in two hedge funds that are in liquidation. These funds have closed and MPERS is awaiting the sale of final assets.

Multi-Strategy: The two funds that make up this group aim to pursue varying strategies in order to diversify risks and reduce volatility. Due to contractual lock-up restrictions, the value of these investments is eligible for redemption in the next six months.

Structured Credit – Relative Value: MPERS currently has one fund that is in liquidation in this strategy.

Commingled International Equity Funds

MPERS invests in three international equity funds that are considered to be commingled in nature. Due to contractual lock-up restrictions, 65% of this capital is eligible for redemption in one month; the remaining 35% has daily liquidity.

Private Real Estate Funds

MPERS invests in three core private real estate funds that are commingled in nature. Two are eligible for redemption on a quarterly basis and one on a daily basis.

Note 3 (g) – Investment Interest Rate Risk

The following table summarizes the maturities of government obligations, corporate bonds, convertible corporate bonds, mortgages, and asset-backed securities which are exposed to interest rate risk.

Summary of Weighted Average Maturities at June 30, 2021

		Investment Maturities (in years)			
Investment Type	**Fair Value**	**Less than 1**	**1 – 5**	**6 – 10**	**More than 10**
Asset-Backed Securities	$277,109,038	$ 0	$ 9,413,085	$113,960,935	$153,735,018
Commercial Mortgage-Backed Securities	27,372,329	0	0	0	27,372,329
Corporate Bonds	5,348,791	0	1,354	210,395	5,137,042
Government Agencies	75,994,553	0	1,483,605	21,036,822	53,474,126
Government Bonds	42,720,547	0	0	10,153,125	32,567,422
Government Mortgage-Backed Securities	20,718,810	0	193,698	342,791	20,182,321
Government-Issued Commercial Mortgage-Backed Securities	1,160,954	0	0	0	1,160,954
Index Linked Government Bonds	23,631,391	0	0	9,242,861	14,388,530
Municipal/Provincial Bonds	155,388,929	227,703	11,583,203	33,666,870	109,911,153
Non-Government-Backed C.M.O.'s	10,115,023	0	656,594	118,680	9,339,749
Total	**$639,560,365**	**$ 227,703**	**$ 23,331,539**	**$188,732,479**	**$427,268,644**

NOTE 3(h) – Investment Credit Ratings

The table below summarizes the credit ratings of the government obligations, corporate bonds, mortgages, and asset-backed securities.

Summary of Credit Ratings as of June 30, 2021

Investment Type	AAA	AA	A	BBB	B	CCC	CC	D	Not Rated	US Gov't Guaranteed	Total
Asset-Backed Securities	$ 84,415,007	$ 59,181,314	$ 6,460,282	$ 0	$ 8,764,185	$ 0	$ 0	$ 0	$118,288,250	$ 0	$277,109,038
Commercial Mortgage-Backed Securities	9,222,004	2,205,244	0	0	0	0	0	0	15,911,090	33,991	27,372,329
Corporate Bonds	0	5,136,518	0	210,395	0	0	0	0	1,878	0	5,348,791
Government Agencies	0	61,925,620	0	0	0	0	0	0	0	14,068,933	75,994,553
Government Bonds	0	0	0	0	0	0	0	0	5,491,250	37,229,297	42,720,547
Government Mortgage-Backed Securities	0	0	0	0	0	0	0	0	57,487	20,661,323	20,718,810
Government-Issued Commercial Mortgage-Backed Securities	0	0	0	0	0	0	0	0	0	1,160,954	1,160,954
Index Linked Government Bonds	0	0	0	0	0	0	0	0	9,242,861	14,388,530	23,631,391
Municipal/Provincial Bonds	40,538,097	94,275,961	650,160	0	0	0	0	0	19,924,711	0	155,388,929
Non-Government-Backed C.M.O.'s	27,639	0	0	177,953	161,158	281,494	99,341	531,511	8,835,927	0	10,115,023
Total	**$134,202,747**	**$222,724,657**	**$ 7,110,442**	**$ 388,348**	**$ 8,925,343**	**$ 281,494**	**$ 99,341**	**$ 531,511**	**$177,753,454**	**$ 87,543,028**	**$639,560,365**

Note 3 (i) – Investment Foreign Currency Risk

Currency risk is the risk that changes to foreign exchange rates will adversely impact the fair value of non-U.S. Dollar denominated assets. The following table summarizes MPERS' exposure to foreign currencies for all assets that are held in custody at the System's custodial bank. MPERS has exposure to foreign currencies in other areas of the portfolio, such as commingled international funds, hedge funds and private partnerships, which are held in the custody of other banks acting as administrators for the funds.

Exposure to Foreign Currency Risk as of June 30, 2021

Foreign Currency	Equities	Real Estate / Partnerships	Total
Australian Dollar	$ 433,269	$ 0	$ 433,269
British Pound Sterling	397,170	1,944,403	2,341,573
Canadian Dollar	172,571	0	172,571
Euro	986,522	30,864,787	31,851,309
Hong Kong Dollar	660,127	0	660,127
Japanese Yen	1,029,251	0	1,029,251
Singapore Dollar	339,175	0	339,175
Swedish Krona	242,859	0	242,859
Total Exposure Risk	**$ 4,260,944**	**$32,809,190**	**$37,070,134**

Note 3 (j) – Securities Lending

In accordance with the Board of Trustees' investment policy, MPERS participates in a securities lending program. The Northern Trust Company administers the program. There are no restrictions on the amount of securities that may be lent.

Securities that may be loaned include U.S. government and agency securities, corporate equity, and fixed income securities. Collateral may include cash, U.S. government securities and irrevocable letters of credit. U.S. securities are loaned in exchange for collateral valued at 102% of the fair value of the securities, plus any accrued interest. Non-U.S. securities are loaned in exchange for collateral valued at 105% of the fair value of the securities, plus any accrued interest. On June 30, 2021, MPERS had no credit risk exposure to borrowers since the amount of collateral exceeded the amount of the loans.

Non-cash collateral cannot be pledged or sold unless the borrower defaults. The average term of the System's loans was approximately 221 days as of June 30, 2021. Cash open collateral is invested in a short-term investment pool, which had an interest sensitivity of 30 days as of June 30, 2021. Cash collateral may also be invested separately in "term loans", in which case the investments match the loan term. These loans can be terminated on demand by either lender or borrower. There were no known violations of legal or contractual provisions, or borrower or lending agent default losses. There were no dividends or coupon payments owing on the securities lent. Securities lending earnings are credited on approximately the fifteenth day of the following month.

Indemnification deals with a situation in which a client's securities would not be returned due to the insolvency of a borrower and Northern Trust would fail to live up to its contractual responsibilities relating to the lending of those securities. Northern Trust's responsibilities include performing appropriate borrower and collateral investment credit analyses and demanding adequate types and levels of collateral.

The following table summarizes the collateral held (including both cash collateral recognized in the Statement of Fiduciary Net Position and non-cash collateral).

Collateral Held as of June 30, 2021

Investment Type	
Equities	$ 29,626,467
Government & Government-Sponsored Securities	64,943,005
Agencies	28,178,164
Total	**$122,747,636**

Note 3 (k) – Derivatives

A derivative financial instrument is an investment whose value depends on the values of one or more underlying assets, financial indexes, or commodity prices. These investments include futures contracts, options contracts, and forward foreign currency exchange. Derivative financial instruments involve credit risk and market risk, as described in Note 3(a), in varying levels.

Through MPERS' external managers, MPERS holds investments in futures contracts, swaps contracts, options contracts, and forward foreign currency exchange contracts. MPERS enters into futures and swaps contracts to gain exposure to certain markets and enters into forward foreign exchange contracts primarily to hedge foreign currency exposure.

The notional value related to these derivative instruments is generally not recorded on the financial statements; however, the change in fair value of these instruments is incorporated in performance. The notional/fair value of $658,164,518 for the various contracts in MPERS' portfolio as of June 30, 2021, is recorded in investments on the Statement of Fiduciary Net Position. The change in fair value of $89,762,141 for the year ended June 30, 2021, is recorded in investment income on the Statement of Changes in Fiduciary Net Position.

Investment Derivatives as of June 30, 2021

Type	Classification	Notional / Fair Value	Unrealized Gain
Futures Contracts	Investments, at fair value	$498,503,501	$73,267,008
Swaps Contracts	Investments, at fair value	159,661,017	16,495,133
	Total	**$658,164,518**	**$89,762,141**

Through the use of derivatives, MPERS is exposed to risk that the counterparties involved in the contracts are unable to meet the terms of their obligation. MPERS' investment managers seek to control this risk through counterparty credit evaluations and approvals, counterparty credit limits, and exposure monitoring procedures. MPERS anticipates the counterparties will be able to satisfy their obligations under contract. The associated counterparty's credit rating is an A+.

NOTE 4 – RECEIVABLES

Receivables as of June 30, 2021

Type	Total
Contributions – MoDOT	$ 5,470,011
Contributions – MSHP Non-Uniformed	1,223,026
Contributions – MSHP Uniformed	2,049,818
Contributions – MPERS	115,921
Investment Interest & Income	4,808,672
Investment Sales	13,388,650
Miscellaneous	3,000
Total	**$27,059,098**

NOTE 5 – CONTRIBUTIONS

MoDOT, MSHP, and MPERS make contributions to the System, as do employees covered under the Year 2000 Plan- 2011 Tier. MPERS permanent funding policy provides for actuarially determined employer contributions using the entry-age normal cost method on a closed group basis (consisting of normal cost and amortization of any unfunded accrued liabilities over a 30-year period, beginning July 1, 2006). (The objective is to reduce the period by one year each year.) A temporary accelerated policy has been adopted where the total contribution is based on entry-age normal cost plus a 15-year amortization period for unfunded retiree liabilities and a 30-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2010. This temporary accelerated policy was adopted by the MPERS' Board of Trustees on September 17, 2009 and will remain in effect until such time as the retiree liability becomes 100% funded or the permanent policy produces a higher contribution rate. Actuarially determined rates, expressed as percentages of annual covered payroll, provide for amounts sufficient to fund those benefits designated by state statute to be funded in advance. Actuarial assumptions used to compute contribution requirements are the same as those used to compute the pension benefit obligation. The employee contribution rate for members of the Year 2000 Plan-2011 Tier is set by statute.

Required employer contributions totaling $208,212,848 for fiscal year 2021, represent funding of normal costs and amortization of the unfunded accrued liability. Actual contributions made were 100% of required contributions. Contribution rates as of June 30, 2021, as determined by the actuarial valuation for the year ended June 30, 2019, are shown in the following table. The Board established actual rates to be the same as the actuarially determined rates.

Contribution Rates

MoDOT, MPERS & Civilian Patrol	Uniformed Patrol	2011 Tier Employee
58.00%	58.00%	4.00%

At the September 26, 2014, Board meeting, the Board adopted the use of a contribution rate stabilization reserve that would result in an MPERS employer contribution rate similar to the fiscal year 2015 rates. The reserve is intended to keep the contribution relatively level over time and may be used if the investment market experiences a downturn in the future. The Board further adopted (in February 2015) that the employer contribution rate would not fall below 58% unless 1) the fund became fully funded or 2) the contribution stabilization reserve reached $250 million. The balance of the reserve as of June 30, 2021, was $96,020,617.

NOTE 6 – DEFERRED RETIREMENT OPTION PROGRAM

MPERS currently provides a BackDROP option. This is an election made at the time of actual retirement. In effect, it provides members an option to elect to receive a portion of their benefits as cash. Since the election is not made until the member actually retires, the option is not treated as a DROP provision in accordance with generally accepted accounting principles.

NOTE 7 – NET PENSION LIABILITY OF EMPLOYERS

The components of the net pension liability of the employers at June 30, 2021, were as follows:

Total pension liability	$ 4,344,072,912
Plan fiduciary net position	(3,003,925,228)
Employers' net pension liability	$ 1,340,147,684
Plan fiduciary net position as a percentage of the total pension liability	69.15%
Covered payroll	$ 359,409,940
Employers' net pension liability as a percentage of covered payroll	372.87%

Actuarial Assumptions

The total pension liability amounts were determined by actuarial valuations as of June 30, 2021, using the following actuarial assumptions, applied to all prior periods included in the measurement:

Inflation	3.00%
Salary Increases	3.00% to 12.45%
Investment Rate of Return	6.50%

The mortality tables, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2014 Healthy Mortality Tables projected to 2022 using projection scale MP-2017. Pre-retirement mortality used were the RP-2014 Employee Mortality Table projected to 2022 using projection scale MP- 2017 and multiplied by a factor of 65%. Disabled pension mortality was based on RP-2014 Disabled Retiree Annuitant Mortality Tables projected to 2022 using projection scale MP-2017.

The long-term (30 year) expected rate of return on pension plan investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of arithmetic real rates of return were adopted by the plan's trustees after considering input from the plan's investment consultants and actuary. These estimates for each major asset class included in MPERS' target asset allocation as of June 30, 2021, (see Note 3) are summarized in the following table:

Asset Class	Long-Term Expected Rate of Return
Global Equity	2.6%
Private Equity	6.6%
Fixed Income	(0.4)%
Opportunistic Debt	4.1%
Real Assets	3.1%
Real Estate	2.5%

Discount Rate

A single discount rate of 6.50% was used to measure the total pension liability. This single discount rate was based on the expected rate of return on pension plan investments of 6.50%. The projection of cash flows used to determine this single discount rate assumed that plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the difference between actuarially determined contribution rates and the member rate. The employers pay the same contribution rate for each employee regardless of the plan the employee was hired under. Based on these assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Regarding the sensitivity of the net pension liability to changes in the single discount rate, the following presents the plan's June 30, 2021, net pension liability, calculated using a single discount rate of 6.50%, as well as what the plan's net pension liability would be if it were calculated using a single discount rate that is 1-percentage-point lower or 1-percentage-point higher:

Current Single Discount

	1% Decrease 5.50%	Rate Assumption 6.50%	1% Increase 7.50%
Net Pension Liability	$1,861,001,061	$1,340,147,684	$906,820,785

NOTE 8 – EMPLOYER PROPORTIONATE SHARE

MPERS, as the administrative agent for the pension system, is also an employer of the pension system. The administrative expenses of the pension system are included in the deductions to the pension system's fiduciary net position. While the employer contributions of the other participating employers are funded from outside revenue sources, the employer contributions of MPERS are funded from sources already recognized as revenues, such as earnings on plan investments or contributions paid by the other participating employers. Attempting to allocate a portion of the net pension liability to MPERS as an employer would result in an allocation of the net pension liability to the other participating employers. Accordingly, MPERS excludes its contributions from the employer proportionate share calculation for the reporting of a net pension liability, by assigning itself a proportionate share of 0%. This exclusion, in essence, shifts the portion of the net pension liability that would accrue to MPERS to the other participating employers.

NOTE 9 – PERSONNEL SERVICES AND RETIREMENT PLAN

MPERS employed 18 full-time employees as of June 30, 2021. Eleven former MPERS employees have retired.

Full-time employees are members of the System (see Note 8). For these employees, MPERS accrued 58.00% of payroll during fiscal year 2021, amounting to $1,219,468. The amounts for fiscal year 2021 and the four preceding years are shown below. These amounts are recorded as both a contribution and administrative expense. Information regarding the retirement plans can be found in Notes 2 and 5.

Net Obligations

Year Ended	Annual Contribution Accrual	
June 30	Percent	Dollars
2017	58.00%	$1,087,268
2018	58.00	1,127,506
2019	58.00	987,370
2020	58.00	987,743
2021	58.00	1,219,468

NOTE 10 – OTHER POST-EMPLOYMENT BENEFITS (OPEB)

In addition to the retirement benefits described previously, MPERS provides a portion of health care insurance through the MoDOT and MSHP Medical and Life Insurance Plan (Insurance Plan) in accordance with Missouri State statutes. The Insurance Plan is considered an agent multiple employer defined benefit plan and is administered by MoDOT. The Insurance Plan is financed on a pay-as-you-go basis and is an internal service fund of MoDOT. As of June 30, 2021, there were 9 inactive (retired) members and 17 active employees participating in the Insurance Plan.

Medical insurance benefits are established by the Insurance Plan's Board of Trustees and are approved by the Missouri Highways and Transportation Commission. Benefits include general inpatient and outpatient medical services; mental, nervous and substance abuse care; and prescriptions. Eligible members are employees who retired from the System with a minimum of 5 years of service and who participate in the Insurance Plan. MoDOT issues a publicly available financial report that includes financial statements and required supplementary information for the Insurance Plan. Requests for this report should be addressed to MoDOT, Financial Services Division, P.O. Box 270, Jefferson City, MO 65102.

Employer and member contributions are established by the Insurance Plan's Board of Trustees and are approved by the Missouri Highways and Transportation Commission. Premiums vary by coverage categories, which include retirees, certain disabled employees, spouses, certain dependents, and survivors of deceased employees and retirees.

Changes in Total OPEB Liability

MPERS' proportionate share (0.15%) of the Insurance Plan's net OPEB liability is $2,019,603 which was measured as of July 1, 2020, and the total OPEB liability used to calculate the net OPEB liability was determined by an actuarial valuation as of that date.

Summary of Changes in Net OPEB Liability for the Year Ended June 30, 2021

	Total
Beginning Balance	$1,552,393
Changes for the year:	
Service Cost	51,302
Interest Cost	55,700
Changes of benefit terms	0
Differences between expected and actual experience	452
Changes in assumptions	393,621
Benefit Payments	(33,865)
Net Changes	467,210
Ending Balance	**$2,019,603**

Deferred Outflows and Inflows

For the year ended June 30, 2021, MPERS recognized net OPEB expense of $104,821 MPERS reported deferred outflows of resources and deferred inflows of resources related to OPEB from the following sources:

Deferred Outflows of Resources and Deferred Inflows of Resources Related to OPEB

	Deferred Outflows	Deferred Inflows
Differences between expected and actual experience	$ 378	$ 18,210
Changes of assumptions or other inputs	329,199	163,912
Contributions subsequent to measurement date	32,274	0
Total	**$361,851**	**$182,122**

Deferred outflows resulting from contributions subsequent to the measurement date will be recognized as a change to the net pension liability in each subsequent year. Other deferred amounts related to OPEB will be recognized in expenses as follows:

Deferred Outflows of Resources and Deferred Inflows of Resources Related to OPEB

Fiscal Year	
2021	$ 30,093
2022	(2,181)
2023	32,060
2024	49,908
2025	62,752
Total Thereafter	7,097
	$179,729

Actuarial Assumptions

The following actuarial assumptions and other inputs, applied to all periods included in the measurement:

Cost method	Entry Age Normal based upon salary
Salary increases	2.50%
Discount rate	2.21%
Investment rate of return	N/A; the plan is unfunded
Health care cost trend rates	5.70%; decreasing to 4.50% in 2025
Retirees’ share of benefit-related costs	43.03% - 60.02%
Admin Expense Trend (Inflation) Rate	3.00%

- The salary increases were based on projected salaries, which include COLAs, provided by MoDOT.
- The discount rate was based on Bond Buyer General Obligation 20-Bond Municipal Bond Index.
- Mortality rates were based on Pub-2010 Public Retirement Plans Safety Employees Mortality Table weighted by Headcount projected by MP-2020.
- The actuarial assumptions used in the June 30, 2020 valuation were based on the results of an actuarial experience study for the period July 1, 2019-June 30, 2020.
- It is assumed the current employer and member contributions will continue as approved by the Commission.

Changes of assumptions and other inputs reflect a change in the discount rate from 3.51% in 2020 to 2.21% in 2021.

The following table illustrates the impact of interest rate sensitivity on the Net OPEB Liability as of June 30, 2021:

Interest Rate Sensitivity

	1% Decrease	**Current Discount Rate**	**1% Increase**
Net OPEB Liability	$2,375,656	$2,019,603	$1,596,717

The following table illustrates the impact of healthcare cost trend sensitivity on the Net OPEB Liability as of June 30, 2021:

Healthcare Cost Trend Sensitivity

	1% Decrease	**Current Discount Rate**	**1% Increase**
Net OPEB Liability	$1,556,046	$2,019,603	$2,441,723

NOTE 11 – CAPITAL ASSETS

Summary of Changes in Capital Assets

	June 30, 2020 Balance	Additions	Deletions / Retirements	June 30, 2021 Balance
Land	$ 84,000	$ 75,293	$ 0	$ 159,293
Building	581,619	0	0	581,619
Furniture, Equipment and Software	3,430,652	8,137	0	3,438,789
Less: Accumulated Depreciation	(3,774,595)	(21,889)	0	(3,796,484)
Total	**$ 321,676**	**$ 61,541**	**$ 0**	**$ 383,217**

NOTE 12 – COMMITMENTS

MPERS has committed $1,667,796,294 of which $1,098,622,784 has been invested, leaving total unfunded commitments to private equity, real estate, real assets, and opportunistic debt of $569,173,510 as of June 30, 2021. The total unfunded investment commitments are not recorded in the accompanying Statement of Fiduciary Net Position.

NOTE 13 – RISK MANAGEMENT

MPERS is exposed to various risks of loss related to natural disasters, asset theft or damage, errors and omissions, torts, and employee injuries.

MPERS has purchased commercial insurance related to capital asset loss and damage. Ancillary coverage provided through the property policy includes coverage for accounts receivable, loss of money and securities, employee dishonesty, and forgery and alterations. MPERS carries a $2 million umbrella liability policy. MPERS has coverage through Missouri Highway and Transportation Commission's Self-Insurance Fund related to workers' compensation. MPERS has also purchased a directors and officers liability policy with $1 million aggregate coverage. This coverage is inclusive of legal defense costs and carries a $35,000 deductible. The State's Legal Expense Fund covers all state employees and officers, and MPERS has purchased surety bonds for the executive director and staff. Settlements have not exceeded coverages for each of the past three fiscal years.

MPERS has a disaster recovery plan that provides for continued computer operations at a remote location should the retirement office be unavailable for normal computing operations.

Schedule of Changes in the Employers' Net Pension Liability
Year Ended June 30

	2021	2020	2019	2018	2017
Total Pension Liability					
Service Cost	$ 43,726,886	$ 44,048,083	$ 43,971,030	$ 46,621,377	$ 45,713,403
Interest on the Total Pension Liability	278,522,994	274,791,358	271,174,089	286,457,436	283,568,441
Benefit Changes	0	0	0	(7,684)	0
Difference Between					
Expected and Actual Experience	(26,471,689)	3,494,582	203,459	(37,173,164)	(37,286,966)
Assumption Change	226,319,675	0	0	142,556,109	0
Benefit Payments	(266,108,191)	(262,710,811)	(255,310,406)	(254,131,209)	(246,617,775)
Refunds	(611,132)	(796,107)	(780,538)	(503,007)	(321,328)
Disability Premiums	(1,600,628)	(1,640,971)	(1,615,860)	(1,601,605)	(1,620,418)
Transfers to Other Retirement Systems	(1,802,900)	(2,457,945)	(2,111,007)	(2,823,042)	(2,724,631)
Net Change in Total Pension Liability	**251,975,015**	**54,728,189**	**55,530,767**	**179,395,211**	**40,710,726**
Total Pension Liability – Beginning	**4,092,097,897**	**4,037,369,708**	**3,981,838,941**	**3,802,443,730**	**3,761,733,004**
Total Pension Liability – Ending (a)	**$4,344,072,912**	**$4,092,097,897**	**$4,037,369,708**	**$3,981,838,941**	**$3,802,443,730**
Plan Fiduciary Net Position					
Contributions – Employer	$ 208,212,848	$ 210,871,852	$ 210,166,927	$ 204,955,180	$ 206,562,924
Contributions – Employee	7,095,963	6,547,351	5,996,344	5,001,418	4,891,932
Pension Plan Net Investment Income	699,644,536	(10,667,857)	154,326,818	197,619,838	220,301,741
Benefit Payments	(266,108,191)	(262,710,811)	(255,310,406)	(254,131,209)	(246,617,775)
Refunds	(611,132)	(796,107)	(780,538)	(503,007)	(321,328)
Disability Premiums	(1,600,628)	(1,640,971)	(1,615,860)	(1,601,605)	(1,620,418)
Pension Plan Administrative Expense	(4,585,473)	(4,291,028)	(4,372,966)	(4,693,492)	(4,515,458)
Net Transfers	277,417	1,025,629	321,363	(955,597)	(980,524)
Net Change in Plan Fiduciary Net Position	**642,325,340**	**(61,661,942)**	**108,731,682**	**145,691,526**	**177,701,094**
Plan Fiduciary Net Position – Beginning	**2,361,599,888**	**2,423,261,830**	**2,314,530,148**	**2,168,838,622**	**1,992,073,946**
Plan Fiduciary Net Position – Ending (b)	**$3,003,925,228**	**$2,361,599,888**	**$2,423,261,830**	**$2,314,530,148**	**$2,169,775,040**
Adjustment – GASB 75 Implementation					**(936,418)**
Plan Fiduciary Net Position – Ending as restated					**2,168,838,622**
Employers' Net Pension Liability (a) – (b)	**$1,340,147,684**	**$1,730,498,009**	**$1,614,107,878**	**$1,667,308,793**	**$1,633,605,108**
Plan Fiduciary Net Position as a % of Total Pension Liability	69.15%	57.71%	60.02%	58.13%	57.06%
Covered Payroll	$ 359,409,940	$ 363,980,262	$ 362,747,630	$ 353,751,292	$ 356,515,416
Employers' Net Pension Liability as a % of Covered Payroll	372.87%	475.44%	444.97%	471.32%	457.95%

Note: These schedules are intended to present information for 10 years but may be built prospectively. Additional years will be displayed as they become available.

Continued on next page.

Schedule of Changes in the Employers' Net Pension Liability
Year Ended June 30 (continued)

	2016	2015	2014	2013
Total Pension Liability				
Service Cost	$ 45,441,305	$ 45,358,095	$ 44,739,603	$ 44,446,279
Interest on the Total Pension Liability	280,432,068	275,284,910	270,525,608	265,339,848
Benefit Changes	0	0	0	0
Difference Between				
Expected and Actual Experience	(39,810,009)	(13,324,219)	(17,614,321)	(13,690,794)
Assumption Change	0	0	0	204,396,180
Benefit Payments	(236,488,629)	(236,905,323)	(227,958,108)	(220,623,394)
Refunds	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Transfers to Other Retirement Systems	(1,921,451)	(3,147,482)	(1,876,336)	(629,246)
Net Change in Total Pension Liability	**45,887,353**	**65,603,910**	**66,266,182**	**277,696,888**
Total Pension Liability – Beginning	**3,715,845,651**	**3,650,241,741**	**3,583,975,559**	**3,306,278,671**
Total Pension Liability – Ending (a)	**$3,761,733,004**	**$3,715,845,651**	**$3,650,241,741**	**$3,583,975,559**
Plan Fiduciary Net Position				
Contributions – Employer	$ 199,609,396	$ 200,638,571	$ 183,353,841	$ 170,836,117
Contributions – Employee	3,482,513	3,294,162	2,260,563	1,139,450
Pension Plan Net Investment Income	21,432,095	92,645,571	319,445,780	198,141,088
Benefit Payments	(236,488,629)	(236,905,323)	(227,958,108)	(220,619,035)
Refunds	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Pension Plan Administrative Expense	(4,370,860)	(4,066,944)	(3,736,355)	(2,997,225)
Net Transfers	808,228	(2,033,045)	(91,954)	(629,246)
Net Change in Plan Fiduciary Net Position	**(17,293,188)**	**51,910,921**	**271,723,503**	**144,329,164**
Plan Fiduciary Net Position – Beginning	**2,009,367,134**	**1,957,456,213**	**1,685,732,710**	**1,541,403,546**
Plan Fiduciary Net Position – Ending (b)	**$1,992,073,946**	**$2,009,367,134**	**$1,957,456,213**	**$1,685,732,710**
Adjustment – GASB 75 Implementation				
Plan Fiduciary Net Position – Ending as restated				
Employers' Net Pension Liability (a) – (b)	**$1,769,659,058**	**$1,706,478,517**	**$1,692,785,528**	**$1,898,242,849**
Plan Fiduciary Net Position as a % of Total Pension Liability	52.96%	54.08%	53.63%	47.04%
Covered Payroll	$ 344,635,441	$ 342,264,593	$ 336,590,797	$ 323,205,767
Employers' Net Pension Liability as a % of Covered Payroll	513.49%	498.58%	502.92%	587.32%

Note: These schedules are intended to present information for 10 years but may be built prospectively. Additional years will be displayed as they become available.

Schedule of Employers' Contributions
Last 10 Fiscal Years

	Actuarially Determined Contributions	Actual Contributions	Contribution Deficiency (Excess)	Covered Payroll*	Contributions as a Percentage of Covered Payroll
2012	$164,884,467	$164,884,467	$0	$344,514,139	47.86%
2013	170,836,117	170,836,117	0	329,863,134	51.79
2014	183,353,841	183,353,841	0	336,799,855	54.44
2015	200,638,571	200,638,571	0	342,211,446	58.63
2016	199,609,396	199,609,396	0	344,154,131	58.00
2017	206,562,924	206,562,924	0	356,142,972	58.00
2018	204,955,180	204,955,180	0	353,371,000	58.00
2019	210,166,927	210,166,927	0	362,356,771	58.00
2020	210,871,852	210,871,852	0	363,572,159	58.00
2021	208,212,848	208,212,848	0	358,987,667	58.00

**Values are estimated from contribution rate and actual contribution amount.*

Schedule of Investment Returns
Last 10 Fiscal Years

Fiscal Year Ended June 30	Annual Money-Weighted Rate of Return
2012	2.80%
2013	13.37
2014	17.58
2015	6.62
2016	1.02
2017	11.22
2018	9.20
2019	6.84
2020	(0.44)
2021	30.79

Notes to Required Supplementary Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuation at the dates indicated. Additional information as of the latest actuarial valuation follows:

Valuation Date .... June 30, 2021
Actuarial Cost Method .... Entry Age
Amortized Method .... Level Percentage of Payroll, Closed
Remaining Amortization Period .... 12 Years (single equivalent period)
Asset Valuation Method .... 3-Year Smoothed Market: 20% Corridor
Inflation .... 2.25% (price inflation)
Actuarial Assumptions
- Investment Rate of Return 6.5%
- Projected Salary Increase .... 3.0% to 12.45% (including 3.0% wage inflation)
- Cost-of-Living Adjustments .... 1.8% Compound

Other Post-Employment Benefits (OPEB) Plan
Schedule of Changes in Net OPEB Liability and Related Ratios for MoDOT and MSHP Medical and Life Insurance Plan

	2021	2020	2019	2018
Total OPEB Liability				
Service Cost	$ 51,302	$ 64,136	$ 66,676	$ 81,000
Interest Cost	55,700	61,346	54,714	49,929
Changes of benefit terms	0	0	0	0
Differences between expected and actual experience	452	(17,475)	(12,565)	0
Changes in assumptions	393,621	(58,897)	(81,559)	(238,129)
Benefit Payments	(33,865)	(35,159)	(34,004)	(37,055)
Net Change in total OPEB liability	467,210	13,951	(6,738)	(144,255)
Total OPEB Liability (Beginning)	**1,552,393**	**1,538,442**	**1,545,180**	**1,689,435**
Total OPEB Liability (Ending)	**$ 2,019,603**	**$ 1,552,393**	**$ 1,538,442**	**$ 1,545,180**
Plan Fiduciary Net Position				
Contributions	$ 33,865	$ 35,159	$ 34,004	$ 37,055
Benefit Payments	(33,865)	(35,159)	(34,004)	(37,055)
Net Change in Plan Fiduciary Net Position	**0**	**0**	**0**	**0**
Plan Fiduciary Net Position (Beginning)	**0**	**0**	**0**	**0**
Plan Fiduciary Net Position (Ending)	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Net OPEB Liability (Ending)	$ 2,019,603	$ 1,552,393	$ 1,538,442	$ 1,545,180
Net Position as a Percentage of OPEB Liability	N/A	N/A	N/A	N/A
Covered-Employee Payroll	$ 1,791,020	$ 1,760,722	$ 1,639,523	$ 790,000
Net OPEB Liability as a Percentage of Payroll	112.76%	88.17%	93.83%	195.59%

Other Post-Employment Benefits (OPEB) Plan
Schedule of MPERS' Proportionate Share of Net OPEB Liability for MoDOT and MSHP Medical and Life Insurance Plan

Year Ended June 30	Proportion of Net OPEB Liability	Proportionate Share of Net OPEB Liability	Covered Employee Payroll	Net OPEB Liability as % of Covered Employee Payroll	Net Position as % of Total OPEB Liability
2018	0.14%	$1,545,180	$ 790,000	195.59%	N/A
2019	0.14%	1,538,442	1,639,523	93.83%	N/A
2020	0.15%	1,552,393	1,760,722	88.17%	N/A
2021	0.15%	2,019,603	1,791,020	112.76%	N/A

Note: These schedules are intended to present information for 10 years but may be built prospectively. Additional years will be displayed as they become available.

Schedule of Administrative Expenses
For the Year Ended June 30, 2021

Personnel Services	
Salary Expense	$ 2,056,242
Employee Benefit Expense	1,666,180
Total Personnel Services	**3,722,422**
Professional Services	
Actuarial Services	100,912
Audit Services	50,400
Legislative Consultant	31,200
Board Governance	90,000
Investment Special Consulting	15,000
Insurance Consultant	6,000
Other Consultant Fees	37,335
Fiduciary Insurance	21,368
IT Hosting and Support	270,770
Other	12,763
Total Professional Services	**635,748**
Miscellaneous	
Depreciation	21,888
Meetings / Travel / Education	13,889
Equipment / Supplies	67,511
Printing / Postage	24,269
Bank Service Charge	9,265
Building Expenses	31,058
Other	59,423
Total Miscellaneous	**227,303**
Total Administrative Expenses	**$ 4,585,473**

Schedule of Investment Expenses
For the Year Ended June 30, 2021

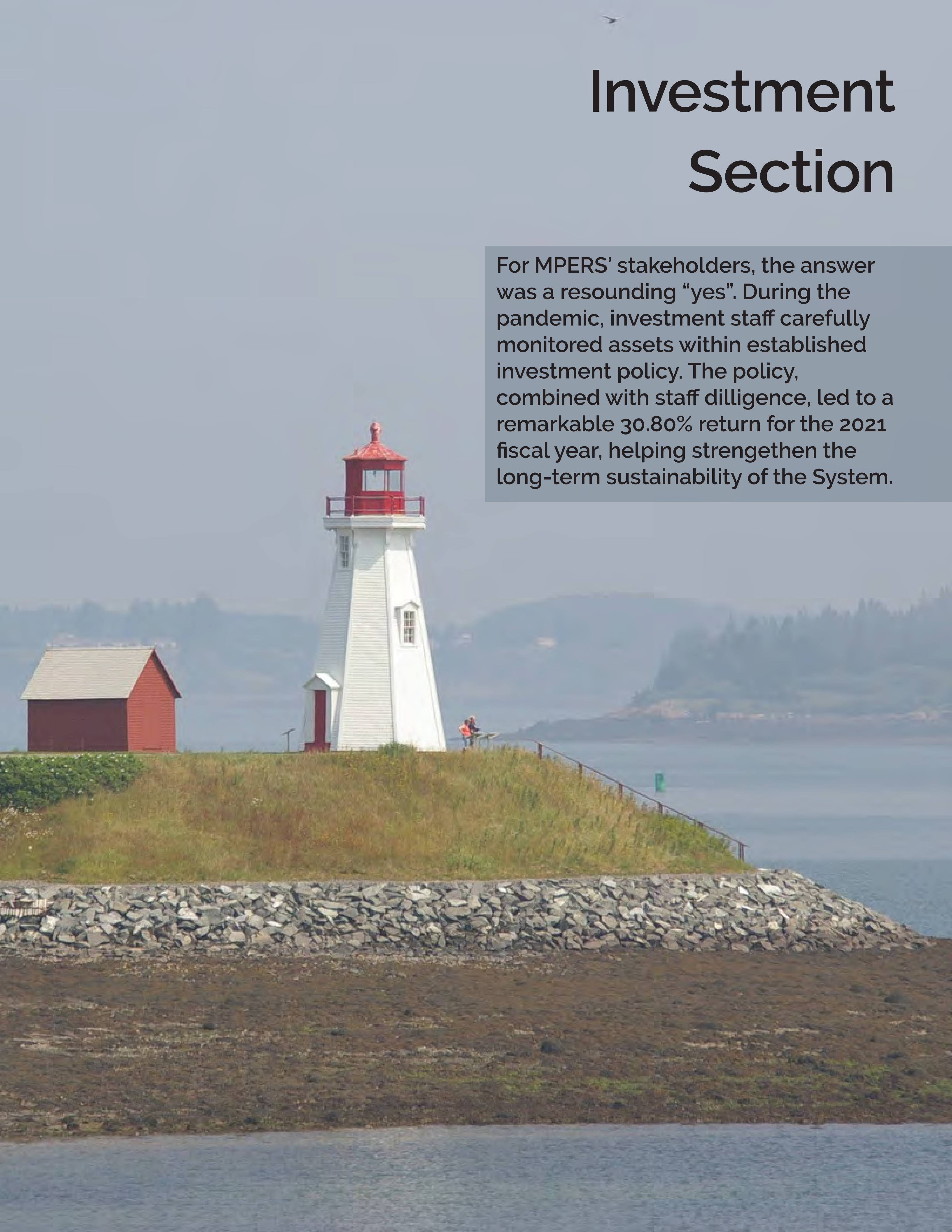
Investment Income Expenses	
Management and Performance Fees by Asset Class	
Equities	$ 2,827,313
Fixed Income Core	226,106
Opportunistic Debt	16,814,532
Real Estate	5,774,516
Private Equity	31,658,397
Real Assets	9,358,849
Hedge Funds	6,973,160
Total Management and Performance Fees	**$73,632,873**
Investment Custodial Fees	54,402
Performance Management	221,442
General Consultant (Monitoring) Fee	344,141
Professional Fees	515,914
Other Fees / Expenses	(164,812)
Total Investment Income Expenses	**$74,603,960**
Securities Lending Expenses	
Borrower Rebates (Refunds)	$ 10,179
Bank Fees	55,908
Total Securities Lending Expenses	**$ 66,087**

Schedule of Consultant and Professional Expenses
For the Year Ended June 30, 2021

Professional / Consultant	Nature of Service	
Gabriel, Roeder, Smith & Co.	Actuarial	$100,912
LexisNexis Risk Data Management	Death Audit Services	1,800
MO Department of Health & Senior Services	Death Audit Services	553
Pension Benefit Information	Death Audit Services	10,297
Deaf Heart Interpreting Services, LLC	Death Audit Services	113
Naught-Naught Agency	Director’s & Officer’s Insurance	21,368
Williams-Keepers, LLC	Financial Audit Services	50,400
Funston Advisory Services, LLC	Governance Consulting	90,000
Midwest Computech	Information Technology	27,712
Huber & Associates	Information Technology	3,300
Levi, Ray & Shoup, Inc.	Information Technology	205,250
Sikich, LLP	Information Technology	31,823
Intermedia	Information Technology	2,685
Thompson Coburn, LLP	Legal Consulting	37,335
Michael G. Winter Consultants, LLC	Legislative Consulting	31,200
Evercore Group, LLC	Market Research	15,000
Charlesworth Benefits	Risk Management Consulting	6,000
Total Consultant and Professional Expenses		**$635,748**

Investment Section

For MPERS' stakeholders, the answer was a resounding "yes". During the pandemic, investment staff carefully monitored assets within established investment policy. The policy, combined with staff dilligence, led to a remarkable 30.80% return for the 2021 fiscal year, helping strengethen the long-term sustainability of the System.



MPERS *Serving those who keep us safe.* **MoDOT & Patrol Employees' Retirement System**

September 29, 2021

To the Board of Trustees and System Members:

It is my pleasure to provide you with the Investment Section of this year's Annual Comprehensive Financial Report (Annual Report). This letter provides an overview of investment performance over the past year and staff's view of the investment market in the years to come.

Dependability through adversity is a very appropriate theme for the investment section of this year's annual report. Despite being dominated by the COVID-19 pandemic and one of the most contentious presidential elections in modern history, MPERS' portfolio generated a 30.8% return in Fiscal Year 2021 (net of all management fees and based on time-weighted rates of return and market valuations) and crossed over the $3.0 billion mark in assets for the first time.

How did this happen? The concept of dependability through adversity was a key theme underlying the rationale to restructure MPERS' investment portfolio over fifteen years ago. The goal was to build a diversified investment structure that would do well across a wide range of economic environments, and to utilize alternative investment structures to lower the volatility of the portfolio in times of market stress. As we review the events that unfolded during Fiscal Year 2021 and MPERS' long-term performance, I hope you agree those efforts are serving the System well.

When we spoke to you last year at this time, COVID-19 was spreading rapidly across the globe, and no one really knew how dangerous it would be or how it would affect our day-to-day lives. Similar to how it touched many of our member's lives, the virus disrupted nearly every facet of MPERS' investment operations. We experienced a significant amount of employee turnover, as the new working environment provided opportunities for some of our long-term employees to further their careers with new organizations. Throughout the year we took significant steps to protect our employees, including new work from home initiatives that allowed our "rebuilt" staff to adapt and continue to generate the strong performance that we, at MPERS, have come to expect. We stuck with several long-term strategies in value and small cap equities that had underperformed in prior years, and watched as they recovered alongside the improving economy.

While adversity does not create character, it will often reveal it. As we look back on the fund's performance in Fiscal Year 2021, nobody would have predicted the results that ultimately unfolded. MPERS' Fiscal Year 2021 return of 30.8% outperformed the actuarial hurdle of 7.0%, the policy benchmark of 23.5% (the hypothetical return earned by investing passively across the targeted asset allocation), and the median public fund return of 26.7%. Perhaps what is most impressive is the fact that MPERS' 1-, 5-, 10-, and 15-year returns have all outperformed those benchmarks as well. The numbers look even better on a risk-adjusted basis, as MPERS' portfolio continues to maintain a lower risk profile than 99% of our peer group (with risk measured by standard deviation of returns over the past ten-year period). The combination of strong returns and low risk has produced a risk/return profile (as measured by a system's

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Website: www.mpers.org • **E-Mail:** mpers@mpers.org

Members of the MoDOT & Patrol Employees' Retirement System
September 29, 2021
Page 2

Sharpe Ratio) in the top 1% of the peer universe. By almost any metric, dependability through adversity was achieved.

Looking toward Fiscal Year 2022 and beyond, the ultimate impact of COVID-19 remains unclear. As we speak, the new delta variant of the virus is spreading rapidly and forcing many regions to reconsider plans to open back up (or remain open) for business. Governments have added an unprecedented amount of liquidity to support the global economy, which has led to asset price appreciation and inflationary pressures in raw materials and labor rates. The one clear takeaway in today's market is the lack of attractive investment opportunities. Interest rates remain at historically low yields despite the increase in inflation and rumors that the U.S. Treasury will soon start to taper its bond purchase program (and therefore reducing demand for bonds), and equity markets are trading at or near all-time highs despite the market uncertainty surrounding the delta variant. COVID-19 contributed to a volatile time period which ultimately led to an attractive entry point to invest new capital. Going forward, the economy will need to find new sources of growth for asset values to continue to ascend higher. Tempering return expectations and building liquidity seems to be a prudent investment strategy over the intermediate term, which should ensure we maintain that dependability for the next round of adversity that will inevitably occur.

Thank you for the opportunity to serve as your Chief Investment Officer, and I hope you enjoy this year's annual report.

Sincerely,

Larry Krummen, CFA
Chief Investment Officer

Kevin M. Leonard
Partner

NEPC LLC
255 State Street
Boston, MA 02109

October 4, 2021

The Board of Trustees
MoDOT & Patrol Employees' Retirement System
PO Box 1930
Jefferson City, MO 65102

Dear Board Members:

In our role as the general investment consultant, we assist the Board in several manners: determining and executing the overall asset allocation strategy of the Plan; advising on the investment policy of the Plan; facilitating investment manager searches (both traditional and alternative asset classes); conducting custodial service searches; providing ongoing performance evaluation for each individual investment manager and the overall investment portfolio; as well as providing pertinent education to the Board.

MPERS' objective is to provide service, disability, death and vested retirement benefits to members and their beneficiaries. To ensure a solid foundation for the future of the System, MPERS has developed an investment program designed to achieve the actuarially assumed rate of return over the long term, while prudently managing the risk of the portfolio. The pension plan is required to satisfy the need to pay accumulated/earned retirement benefits today, while at the same time be prepared for "uncertain" future benefits. This balancing of short-term versus long-term needs is a key tenant in the overall construction of the portfolio. To facilitate this balance, the Board has adopted a diversified asset allocation structure. Our goal is to diversify the System's assets within the traditional and non-traditional asset classes to reduce volatility, achieve above market returns, and to better protect the portfolio against difficult market conditions.

MPERS Fiscal Year 2021 Performance and Key Initiatives

For the fiscal-year-ending June 30, 2021, the MPERS Total Plan returned 30.8% on a net-of-fees basis, outperforming the policy index return of 23.47%. For the fiscal-year-ending June 30, 2021, relative to the peer group comparison (InvMetrics Public DB Net Universe), MPERS ranked in the 9th percentile (1st percentile being the highest, 100th percentile being the lowest). For the fiscal year, total Plan outperformance (relative to policy index) was driven by relative outperformance in the public equity, traditional fixed income, opportunistic debt, real assets and real estate portfolios. The only portfolio to underperform its respective benchmark was the private equity portfolio with a return of 52.2% versus 60.9% for the benchmark. Although underperforming its benchmark, the private equity portfolio was the highest absolute performing portfolio for the year with its return of 52.2%.

During Fiscal Year 2021, key initiatives accomplished included:

- Conducted a comprehensive/formal review of the Plan's asset allocation in concert with NEPC's 2021 Client Actions and Asset Class Assumptions.
    - As part of the review, NEPC and Staff evaluated the Plan's existing asset allocation and discussed any potential changes to its current structure.
        - Based on the review and discussions, no changes were recommended.
- A liquidity study was conducted as part of the asset allocation review.
    - The results of the liquidity study reaffirmed that the Plan's liquidity remains healthy enough to support the current allocation to alternative investments, but certain economic environments may change the liquidity profile of the Plan meaningfully.
- Continued to develop the alternative investment portfolio.
    - A private market pacing plan was conducted for the opportunistic debt, private equity, real assets, and real estate portfolios. Each pacing plan provided a recommended commitment amount for upcoming vintage years.
    - New commitments were made to the opportunistic debt, private equity, real assets, and real estate portfolios.
- Began discussions with Staff on a restructuring of the public equities' portfolio.
    - It anticipated that the changes to the public equities' portfolio will be implemented in FY 2022.

As the asset allocation strategy evolves year-after-year, diversification and risk mitigation will continue to be the pillars of MPERS' asset allocation structure.

NEPC, LLC appreciates the opportunity to serve as your consultant. It is a pleasure to work with MPERS and we look forward to continuing our relationship for the benefit of the Board, Staff, and most importantly, the members of the System.

Best Regards,

Kevin M. Leonard, Partner

Investment Activity Overview

Summary of Investment Policy

The primary objective of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS, Plan or System) is to provide active and retired employees with the retirement benefits provided under Missouri law. The investment portfolio is constructed to generate a total return that, when combined with employer contributions, is sufficient to meet these benefit obligations. Following prudent standards for preservation of capital, the goal is to achieve the highest possible rate of return consistent with the Plan's tolerance for risk as determined by the Board of Trustees (Board) in its role as fiduciary. The Board has adopted the following guiding principles to fulfill its fiduciary duty:

1. Preserve the long-term corpus of the fund.
2. Maximize total return within prudent risk parameters.
3. Act in the exclusive interest of the members of the System.

Risk awareness and risk management are essential to any organization. MPERS' Investment Policy is the starting point of our investment risk management process. Through the Investment Policy, the Board has defined the desired goals and outcomes of the investment program, including provisions that:

- define the assumed rate of return for the portfolio (currently 7%),
- establish an asset allocation that is expected to meet the assumed rate of return while minimizing the volatility of the fund's contribution rates,
- define the approved asset classes and investment strategies,
- delegate the day-to-day management of the investment portfolio to MPERS' staff and external asset managers,
- establish a range of asset class allocations from which the CIO can operate,
- establish procedures for hiring and terminating investment managers, and
- establish ongoing due diligence requirements for existing managers.

Throughout the Investment Policy, two key investment beliefs dominate the daily management of the investment portfolio.

1. Diversification is critical because the future is unknown.
2. Flexibility in investment policy implementation is critical because particular asset classes will be in or out of favor at various points in the economic cycle.

To ensure the fund is operating within the risk parameters established in the Investment Policy, staff monitors the performance of the fund relative to MPERS' policy index. The policy index is the return that would be generated if MPERS' portfolio were invested passively across the targeted asset allocation. MPERS' investment staff strive to achieve returns that are equal to or greater than the policy index while taking equal or less risk relative to the policy index (with risk defined by standard deviation of return). The table below shows how MPERS' portfolio compares to both the policy index and the median fund in MPERS' public fund peer universe as well as to commonly used risk measures.

Total Portfolio – Statistical Performance

Portfolio Characteristic	**1-Year**	**3-Year**	**5-Year**	**10-Year**
Annualized Total Plan Return (net of all fees and expenses)	**30.80%**	**11.63%**	**11.10%**	**9.59%**
Annualized Policy Benchmark Return	*23.47%*	*11.79%*	*10.79%*	*8.79%*
Annualized Peer Median Return	*26.72%*	*11.58%*	*11.00%*	*8.51%*
Total Plan Standard Deviation(1)	**5.70**	**7.17**	**5.75**	**5.24**
Policy Benchmark Standard Deviation	*7.16*	*7.81*	*6.27*	*5.68*
Peer Median Standard Deviation	*8.85*	*11.87*	*9.58*	*8.89*
Total Plan Sharpe Ratio(2)	**5.40**	**1.45**	**1.74**	**1.72**
Policy Benchmark Sharpe Ratio	*3.27*	*1.36*	*1.55*	*1.45*
Peer Median Sharpe Ratio	*3.01*	*0.90*	*1.04*	*0.91*
Correlation to Policy Benchmark(3)	**0.87**	**0.91**	**0.91**	**0.89**

(1) *Standard Deviation* measures historical volatility and specifically measures the dispersion of a set of data points (i.e. monthly returns from their mean. If the data points are further from the mean, the standard deviation is higher.

(2) *Sharpe Ratio* measures historical volatility and specifically measures the dispersion of a set of data point (i.e. monthly returns from their mean. If the data points are further from the mean, the standard deviation is higher.

(3) *Correlation* measures how the System's portfolio and the policy benchmark moves are related and if both have reacted to market forces in the same manner. The System's portfolio has a correlation of less than 1, indicating that while it will typically move in the same direction as the policy benchmark, it will not move in lockstep with the total policy benchmark.

When evaluating these results, it is important to note that MPERS' policy index is comprised of a mix of asset classes, including several alternative asset classes, with benchmarks that are not investable (notably private equity with its S&P 500 + 3% illiquidity benchmark, real assets with its CPI + 4% real return benchmark, and the real estate benchmark). MPERS also evaluates investment performance on a net-of-fees basis, while acknowledging that most asset class benchmarks report performance on a gross-of-fees basis. Investment fees represent a significant hurdle for staff to overcome when comparing results to MPERS' policy index, which is demonstrated by how well MPERS' policy index has performed relative to the broader public fund peer universe. MPERS' strong risk-adjusted performance provides the Board with the confidence that it has adopted a prudent investment strategy, fulfilling the Board's fiduciary duty.

Fair Value of Investments

As of June 30, 2021, MPERS' investment portfolio had a total fair value of $3.0 billion, representing an increase of $642 million from Fiscal Year 2020. Over the course of the year, $58 million was transferred out of the fund to make benefit payments and meet other obligations. When viewed together, the net increase to the portfolio from investment activity equated to $700 million.

Investment Performance

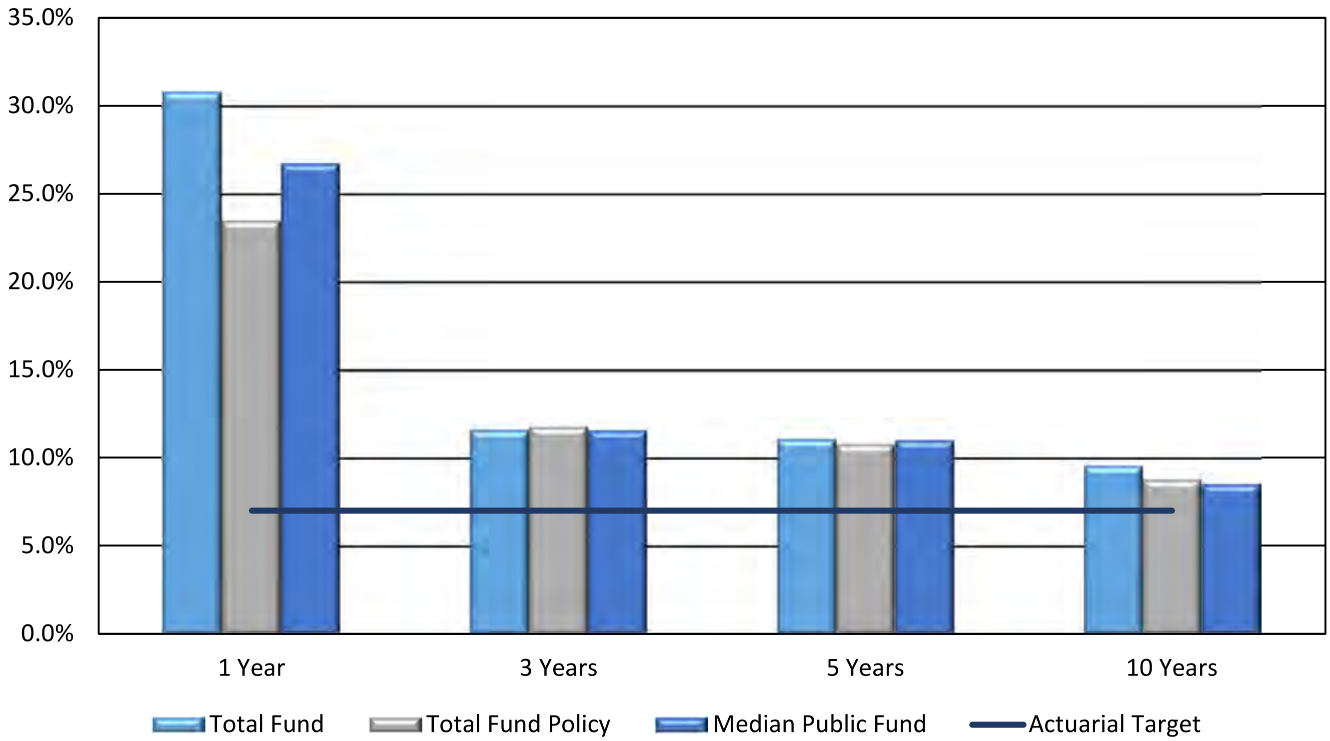
MPERS' investment portfolio generated a 30.80% return for Fiscal Year 2021, net of all investment fees and based on time-weighted rates of return and market valuations. The performance across the major asset classes (and respective benchmarks) is listed below.

Investment Performance (Including Benchmarks)	1-Year	3-Year	5-Year	10-Year
Total Fund	**30.80%**	**11.63%**	**11.10%**	**9.59%**
Policy Benchmark	*23.47*	*11.79*	*10.79*	*8.79*
Peer Universe Ranking %	*9.00*	*50.00*	*47.00*	*14.00*
Global Equity	**47.54**	**12.44**	**13.56**	**10.26**
MSCI ACWI	*39.26*	*14.57*	*14.61*	*9.90*
Private Equity	**52.18**	**22.29**	**18.67**	**15.44**
S&P 500 + 3%	*60.87*	*20.24*	*19.74*	*17.30*
Fixed Income	**1.53**	**4.56**	**3.09**	**3.99**
Barclays US AGG Gov/Credit	*-0.39*	*5.95*	*3.31*	*3.71*
Opportunistic Debt	**27.41**	**9.13**	**N/A**	**N/A**
Barclays US Corp HY	*15.37*	*7.45*	*N/A*	*N/A*
Real Estate	**12.79**	**8.96**	**8.82**	**10.72**
NFI-ODCE	*7.96*	*5.19*	*6.09*	*8.89*
Real Assets	**14.90**	**2.75**	**5.51**	**N/A**
CPI + 4%	*9.59*	*6.63*	*6.51*	*N/A*

All of MPERS' investment returns are reported net of all investment fees.

When evaluating performance, the Board of Trustees looks at three primary performance objectives: a) meet or exceed the actuarial assumed rate of return of 7% over long periods of time, b) outperform a policy benchmark that represents the return that could be achieved by investing passively in the broad markets in the same percentages to MPERS' target asset allocation, and c) rank at or above the public fund peer group's median investment return.

Historical returns compared to the three primary performance goals are listed graphically below:



Fiscal Year 2021 was a historic year for MPERS' investment portfolio, as the 30.8% return pushed the overall asset base over the $3.0 billion mark for the first time. Performance was strong across any metric, as MPERS' fiscal year return considerably outperformed the actuarial assumed rate of return, the policy index return, the median public fund return, and a passive 60/40 stock/bond allocation. Perhaps the most impressive of those metrics is the outperformance relative to MPERS' policy index, which generated a 23.47% return. As a reminder, MPERS' policy index is the return expected to be earned if an investor could invest passively across the approved asset allocation over the entire measurement period. Several long term strategies within value and small cap equities, which had underperformed in prior years, quickly recovered alongside the improving economy and led to strong performance in the public equity portfolio (producing a 47.54% for the year versus a benchmark return of 39.26%). The opportunistic debt portfolio also had an excellent year, generating as 27.41% return relative to the benchmark return of 15.37%.

MPERS' long-term performance remains strong according to any metric. MPERS' ten-year return ranks in the top 14% of the public fund peer universe, with a risk profile (as measured by volatility of returns) in the bottom 1% of the same peer universe. The long-term success of the program serves as a reminder for MPERS' staff to focus on the long-term goals of the system, which includes not overreacting to the short-term underperformance that occurred during the onset of the COVID-19 pandemic.

Asset Allocation Overview

MPERS' asset allocation is reviewed annually by the Board of Trustees, with a more formal asset/liability study completed at least every five years (the most recent study was completed in fiscal year 2020). The asset allocation in place today is a culmination of over 15 years of restructuring the portfolio with the goal of performing well across various market environments, not just when the stock market rallies. Those efforts have served the System well, generating consistent performance results with a lower risk profile (as measured by standard deviation of returns). MPERS' 10- and 15-year returns have a Sharpe ratio that ranks in the top 1% of the public fund peer universe (a Sharpe ratio measures a system's risk-adjusted returns, or the amount earned for a given level of risk). The reduced volatility in the portfolio has also lowered the volatility of contribution rates for the employers, which have now remained stable for nine consecutive years after climbing considerably after the financial crisis.

MPERS' breaks down all investment strategies into three broad beta groups (equities, interest rates and credit, and real assets). As of June 30, 2021, all of the sub-asset class allocations were within the acceptable ranges established by MPERS' Investment Policy. The table below lists the ending allocations as of June 30, 2020, along with the target and actual asset allocation as of June 30, 2021. Following the table are descriptions of each beta group and its underlying assets.

Beta Group *Sub Asset Allocation*	**Ending FY 20 Allocation**	**FY 21 Target Allocation**	**Ending FY 21 Allocation**
Equity Beta	**52.51%**	**50.00%**	**51.93%**
Public Equity	*37.90*	*40.00*	*36.03*
Private Equity	*14.62*	*10.00*	*15.90*
Rates and Credit	**26.28**	**30.00**	**25.77**
Traditional Fixed Income	*15.66*	*22.50*	*15.41*
Opportunistic Debt	*10.62*	*7.50*	*10.35*
Real Assets	**20.75**	**20.00**	**18.19**
Real Assets	*11.93*	*10.00*	*11.10*
Real Estate	*8.83*	*10.00*	*7.09*
Cash	**0.46**	**0.00**	**4.11**

Equity Beta

The equity beta group is comprised of three asset types: public equity, private equity and hedged equity. The equity beta group currently represents 51.93% of the overall portfolio. Within that overall equity allocation, the fund is overweight private equity structures (15.90% versus the target of 10%), which is offset by an underweight to public equity (36.03% versus new target of 40%). In addition, 4.4% of the 36% of public equity is within the hedged equity allocation which did not have the same market exposure as the broad equity benchmarks for the majority of the fiscal year. The result of the current positioning is an underweight to the traditional equity markets.

Public Equity

MPERS' public equity portfolio ended Fiscal Year 2021 with a 47.54% return, outperforming the global equity policy benchmark of 39.26%. The outperformance relative to policy benchmarks was a welcome reversal to the underperformance that occurred in prior years. MPERS' equity portfolio has historically been biased towards small cap and value strategies. The outbreak of COVID-19 sent a wave of volatility through the public equity markets. After global banks and policy makers responded with an unprecedented amount of government stimulus, the markets stabilized and rallied strongly over the course of Fiscal Year 2021. The initial rebound in the public equity markets was dominated by a handful of growth companies that were positioned to benefit from the "new normal" brought about by a global pandemic (to which MPERS was underweight). As businesses and consumers migrated to working from home, technology stocks that helped citizens cope with the pandemic witnessed extraordinary gains, while traditional (and value based) industries such as airlines, hotels and restaurants struggled to stay afloat. As the economy re-opened, many of those value based industries also recovered which helped MPERS' equity portfolio outperform the underlying benchmarks.

Private Equity

On January 1, 2019, MPERS lowered the target to private equity from 15% to 10%. While private equity continues to be the best performing asset class in MPERS' portfolio over the long term, staff is cognizant of the massive amounts of money raised in the sector over the past several years and the risks that it brings to future performance. Staff remains disciplined by slowing the investment pace and not "following the herd" of capital that is aggressively coming to the market during this late stage of an economic recovery. New commitments are focused on existing managers who are coming back to market and who have performed well. The portfolio continues to mature nicely as evidenced by Fiscal Year 2021 being the seventh consecutive year where distributions from investments outpaced new capital calls. As less money is committed to new funds during the coming years, the allocation to private equity should gradually decline in the direction of the new targeted allocation.

Private equity generated a 52.18% fiscal year return, underperforming the benchmark (S&P 500 + 3%) return of 60.87%. While staff is pleased with the 52% return, it was yet another year where the portfolio underperformed the "public equity plus" benchmark. This remains an extremely difficult benchmark given the strength of public equity markets and will likely be difficult to beat in a Fed-financed asset market environment. However, private equity remains MPERS' best performing asset class over longer-term time periods and represents a growing investment opportunity set that public equities do not offer.

Rates and Credit Beta
The rates and credit beta group consists of the traditional fixed income portfolio and the opportunistic debt portfolio. The overall allocation stands at 26.28% versus the new target of 30%. During Fiscal Year 2021, the traditional portfolio delivered a 1.53% return (versus the benchmark of -0.39 %) and the opportunistic debt portfolio gained 27.41% in value (versus the benchmark of 15.37 %).

Traditional Fixed Income
MPERS remained consistently underweight the targeted fixed income allocation of 20% throughout Fiscal Year 2021 and ended the year with a 15.41% allocation compared to the new target asset allocation of 22.5%. Yields on the U.S. Treasury bonds rose considerably during the year, with the 10-year Treasury bond rising from 0.65% to 1.47% and the 30-year Treasury bond rising from 1.41% up to 2.09%. The rising interest rate environment sent existing bond prices lower, which led to the -0.39% return for the fixed income benchmark. The unique structure and lower duration profile of MPERS' traditional fixed income portfolio (relative to the benchmark) was able to generate a 1.53% return for the year.

The falling yields in traditional fixed income markets continues to create a dilemma for pension investors looking forward. While fixed income strategies (particularly long duration treasuries) offer the best diversification against equity market risk, their low yields create challenges in meeting MPERS' long-term actuarial return target of 7.0%. At the time of this report, the 30-year Treasury bond had a yield of roughly 1.9%. Simple mathematics show that for every dollar invested that earns 1.9%, another dollar must be invested in "something" that earns 12.1% to generate an average return of 7.0%. Given the uncertainty in the economy and relatively high valuation of the equity markets, very few strategies have the potential to generate those returns. The dilemma is that investing in the asset class that offers the best protection against equity market risk is also the same asset class that virtually guarantees underperformance of the actuarial hurdle in the coming years. For these reasons, opportunistic debt strategies are favored over the traditional fixed income markets.

Opportunistic Debt
The offset to MPERS' underweight position to traditional fixed income is a modest overweight position to opportunistic debt strategies. The year began with a 10.62% allocation relative to a 7.5% policy target and ended the year at 10.35%. The asset class generated a 27.41% return which outperformed the publicly traded high yield benchmark return of 15.37%.

The opportunistic debt portfolio is diversified among direct lending, public market investments and distressed investments. The portfolio is largely built out and most of the focus in recent years has been on pivoting commitments away from direct lending and toward strategies that have flexibility to be more opportunistic. Recent commitments to opportunistic strategies were done in anticipation of a more volatile environment in future years. Those commitments had an active year and produced strong results given the global dislocation caused by COVID-19. Many of those strategies continue to have dry powder and staff expects those strategies to benefit from continued uncertainty in the global economy. The pace of new commitments is expected to be in line with past years and should be partially funded by rotating exposure from underperforming legacy investments to strategies expected to benefit in a post-COVID investing environment

Real Assets Beta
The real assets beta group includes MPERS' real estate holdings along with the broader real asset strategies, e.g., energy, infrastructure, timber, and mining. The overall allocation to the real assets beta group stands at 18.19% (relative to the target allocation of 20%), and generated a 14.06% return in Fiscal Year 2021. The broader real asset strategies returned 14.90% for the year (versus the benchmark of 9.59%), with the various real estate strategies producing a 12.79% return (versus the benchmark of 7.96%).

Real Estate
The underlying real estate allocation has a target of 10% of assets and includes a mix of public and private equity strategies, along with tactical exposures to public and private debt strategies. MPERS started the year with an 8.83% allocation and ended with a 7.09% allocation. The portfolio generated a 12.79% return for the year, outperforming the policy benchmark return of 7.96%. The core real estate portfolio (primarily stabilized and fully leased properties) generated a 9.11% return, while the non-core portfolio (value-added or opportunistic real estate strategies) returned 13.46%. The publicly traded REIT (real estate investment trust) portfolio was especially strong, returning 38.61% for the year after losing 14.87% the year before.

The COVID-19 pandemic continues to create dramatic changes in the real estate markets and will likely impact the investing environment for years to come. The clear winner thus far has been the industrial sector, as the surge in online shopping has led to increased demand for "last mile" distribution centers. As the world adapts to working from home, the number of office and retail centers continues to adjust to the lower demand, while multi-family strategies continue to be a stable source of income. Several value added and opportunistic managers in the portfolio have substantial dry powder (ability to deploy new capital), and are well positioned to benefit from this changing investment climate. Given the current underweight position, the pace of new commitments is expected to increase in the coming years.

Real Assets

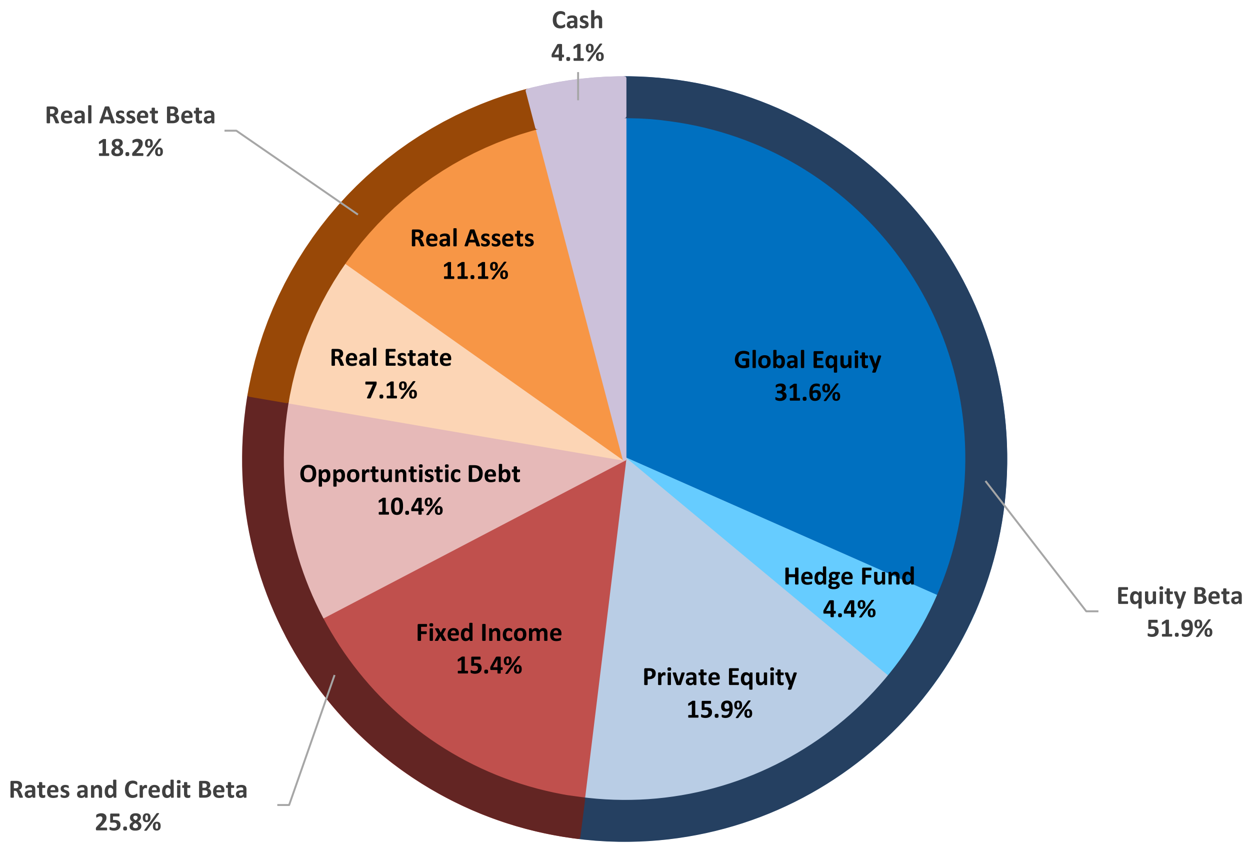
The underlying real asset allocation has a target of 10% of assets and includes a mix of natural resource strategies, infrastructure and transportation, and timber strategies. MPERS started the year with an 11.93% allocation and ended modestly lower with an 11.10% allocation. The portfolio generated a 14.9% return for the year, outperforming the policy benchmark return of 9.59%. The rebound in oil prices led to strong performance in MPERS' energy based strategies, which represent approximately 40% of the real assets portfolio. Overall, the natural resources portfolio was up 17.26% on the year. The timber portfolio also performed well, as increases in lumber and recreational land values helped the portfolio generate a 12.84% return. MPERS' infrastructure strategies had another consistent year and produced a return of 8.37%.

Longer term, the asset class has slightly underperformed the policy benchmark as a result of weak performance from energy managers. Staff continues to diversify the asset class including timber, metals and mining, and infrastructure assets. While COVID-19 led to dramatic demand destruction in the oil and gas markets in the short term, prices quickly recovered as producers scaled back exploration activity. Over time, this could set the stage for an improved commodity price environment and a better return environment for real asset strategies. Commitment pacing is expected to slow as a result of the overweight position in the asset class and the focus will be on targeted investments which complement the existing exposures.

Looking Forward

The outbreak of COVID-19 brought an end to longest economic expansion in history, but that quickly turned around and led to a historic rebound for investment markets and financial assets across the globe. Looking forward, the ultimate impact of COVID-19 remains unclear. The new delta variant of the virus is spreading rapidly and forcing many regions to reconsider plans to open back up (or remain open) for business. Governments have added an unprecedented amount of liquidity to support the global economy, which has led to asset price appreciation and inflationary pressures in raw materials and labor rates. Despite the increased inflationary risks and the uncertainly around the delta variant, interest rates remain extremely low and equity market valuations are at the high range of historical measures. There is a clear disconnect between the level of interest rates, the recovering economy, and equity market valuations. With this backdrop, the one clear takeaway is the lack of attractive investment opportunities. The combination of low interest rates and equity valuations at historically high levels suggests a low return environment going forward.

COVID-19 provided an attractive entry point to invest new capital. Going forward, the economy will need to find new sources of growth for asset values to continue to ascend higher. Further government stimulus can help fill that void, but will come at the expense of higher taxation which puts profit margins and equity valuations at risk. Tempering return expectations and building liquidity seems to be a prudent investment strategy over the intermediate term, which should ensure we maintain that dependability for the next round of adversity that will inevitably occur. Pension fund investors will need every tool available to meet long-term goals and objectives and will likely have to look outside the traditional stock and bond markets to find strategies capable of generating attractive returns. Fortunately, MPERS' diversified asset allocation includes a mix of strategies that are designed to perform well throughout a wide range of investment markets, and staff is confident the portfolio is well positioned to meet the long-term goals of the system.



Amounts Reported by Beta Groups and Management-Type Allocation
June 30, 2021

	Fair Value	Percent of Fair Value
Global Equity		
Global Public Equity	$ 949,341,643	31.6%
Private Equity	477,536,803	15.9%
Hedged Equity	132,635,653	4.4%
Rates and Credit		
Fixed Income	462,785,799	15.4%
Opportunistic Debt	310,913,594	10.4%
Real Assets		
Real Estate	212,966,617	7.1%
Real Assets	333,377,752	11.1%
Cash	123,275,859	4.1%
Total Investments	**$3,002,833,720**	**100.0%**

Reconciliation to Statement of Plan Net Assets:	
Less: Accrued Investment Interest and Income	$ (4,808,672)
Less: Investment Sales Receivable	(13,388,650)
Plus: Investment Purchases Payable	17,745,043
Currency Adjustment	156,057
	$3,002,537,498

Largest Equity Securities
(Non-Commingled Funds)

Security	Fair Value	Percent of Total
CENTRAL BANCOMPANY CDT-CL B NON VTG CDT-CL B NON VTG	$2,750,090	0.616%
AMERANT BANCORP INC CL B CL B	1,653,416	0.371
INTL BANCSHARES CORP COM	1,388,336	0.311
QCR HLDGS INC COM	1,187,919	0.266
TEXAS CAP BANCSHARES INC DEL COM	1,177,549	0.264
FIRST BANCORP P R COM NEW COM NEW	1,097,832	0.246
W T B FINANCIAL CORP CMT-CL B COMN STOCK	1,066,650	0.239
INVESTAR HLDG CORP COM	1,055,046	0.237
BLUE RIDGE BANKSHARES INC VA CDT-COM CDT-COM	1,010,519	0.227
METROPOLITAN BK HLDG CORP COM	983,272	0.220

Largest Fixed Income Securities
(Non-Commingled Funds)

Par Value	Security	Fair Value
$21,131,885	PVTPL ED LN AST-BACKED TR I 2013-1 SR NTCL A2 144A VAR RT DUE 04-26-2032 BEO	$21,275,341
15,000,000	FEDERAL FARM CR BKS 3.1% 01-04-2035	17,296,982
10,000,000	UNITED STATES OF AMER TREAS BONDS 0.75 DEB TIPS 02-15-2042	14,388,530
12,050,000	NORTHSTAR ED FIN INC DEL 2007-1 STUDENT LN ASSET BKD NT CL 1A-6 01-29-2046 BEO	12,058,327
10,000,000	FFCB DTD 2.93 04-27-2029	11,254,957
10,000,000	UNITED STATES OF AMER TREAS BONDS DTD 05/15/2016 2.5% DUE 05-15-2046 REG	10,833,594
10,000,000	UNITED STATES TREAS BDS DTD 00247 2.5% DUE 02-15-2046 REG	10,832,813
10,000,000	UNITED STS TREAS NTS DTD 05/15/2021 1.625% 05-15-2031	10,153,125
25,644,000	TN VY AUTH FED BOOK ENTRY PRIN STRIPS GENERIC PRIN PMT 04-01-2056 (UNDDATE)	10,055,556
10,000,000	PVTPL SLM STUDENT LN TR SER-03-14 CL-A7 VAR 10-25-2065 BEO	10,051,903
10,000,000	ACCESS GROUP INC DEL 2004-1 STUD LN AST BKD NT CL A-4 12-27-2032/09-27-2007 REG	9,764,127
9,820,000	CONNECTICUT STUDENT LN FNDTN STUDENT LN ARCS-SR SER A-1 01 JUN 2046	9,747,916
6,000,000	UNITED STATES TREAS BDS INDEX LINKED 1.75 DUE 01-15-2028 REG	9,242,861
9,150,000	BRAZOS HIGHER ED AUTH INC STUD LN BKD NT2007-1 CL I-A-4 VAR RT DUE 06-25-2043	8,889,682
6,995,000	FFCB 3.89% DUE 06-01-2043	8,761,318
9,600,000	EDUCATION LN ASSET BACKED TR I VAR RT 4.25% 08-01-2043 REG	8,304,000
6,941,142	SLM STUDENT LN TR 2013-6 CL A-3 FLTG 06-26-2028	6,993,137
6,700,000	CONNECTICUT STUDENT LN FNDTN STUDENT LN ARCS-SR SER A-2 01 JUN 2046	6,650,819
5,000,000	FEDERAL FARM CR BKS CONS SYSTEMWIDE BDS 3.03% 11-03-2033	5,716,795
4,000,000	UNITED STATES TREAS BDS DTD 02/15/2006 4.5% DUE 02-15-2036 REG	5,491,250

Space restrictions make it impractical to include the entire investment portfolio in this report. However, a portfolio listing is available for review in the office of the executive director of MPERS.

Investment Fees

Historically, MPERS has reported investment management fees and accrued incentive fees (performance fees), and this year MPERS has expanded reporting to include fund pass-through expenses and portfolio company expenses. MPERS reports returns net of all fees and expenses; the additional fee categories reported have no impact on investment performance or returns. Comparing fees among peers is challenging given the lack of industry standard governing fee reporting. MPERS has taken a very conservative approach and reports all fees.

The strongest driver of fees is MPERS' asset allocation and use of private assets. Private assets have served an important role in MPERS' asset allocation including diversification and alpha generation. MPERS continues to monitor fees during the manager due diligence process and considers fees to be one factor when making investment decisions. MPERS strives to produce the highest net-of-fee returns regardless of the investment structure.

Summary of Investment Expenses

For the Year Ended June 30, 2021

Investment Income Expenses	
Management and Performance Fees by Asset Class	
Equities	$ 2,827,313
Fixed Income Core	226,106
Opportunistic Debt	16,814,532
Real Estate	5,774,516
Private Equity	31,658,397
Real Assets	9,358,849
Hedge Funds	6,973,160
Total Management and Performance Fees	**$73,632,873**
Investment Custodial Fees	54,402
Performance Management	221,442
General Consultant (Monitoring) Fee	344,141
Professional Fees	515,914
Other Fees / Expenses	(164,812)
Total Investment Income Expenses	**$74,603,960**

Expenses Accrued, Fiscal Year 2021

Manager	Base Fees	Pass Through Fund Expenses[1]	Performance Fees	Portfolio Company Expenses[2]	Total
Aberdeen Asset Management	$ 8,182	$ 0	$ 0	$ 0	$ 8,182
ABRY Partners	14,164	4,596	172,439	0	191,199
Acadian Asset Managers	784,583	0	0	0	784,583
Aisling Capital	80,584	27,113	1,925,724	0	2,033,421
Alpstone Capital	170,623	23,252	0	0	193,875
American Infrastructure	47,063	44,859	0	0	91,922
American Timberland Co.	286,039	0	0	0	286,039
Anchorage Advisors	318,200	0	2,371,753	0	2,689,953
Apollo Real Estate	0	19,530	0	0	19,530
Ares Management	372,057	29,300	0	0	401,357
Arrowroot Capital	393,201	66,819	1,647,624	0	2,107,644
Audax Group	0	0	0	0	0
Banner Ridge Partners	337,500	13,918	1,367,390	0	1,718,808
Blackstone Investment	643,088	145,701	2,202,466	0	2,991,255
Blue Road	130,374	33,277	599,947	0	763,598
Bridgewater	506,294	21,065	0	0	527,359
Brooke Private Equity Advisors	11,250	(45,548)	62,811	0	28,513
Car Val Investors	95,606	0	383,520	0	479,126
Carlyle Aviation Partners	178,715	0	40,736	0	219,451
Catchmark	24,830	0	116,035	0	140,865
CBRE Clarion	47,385	32	0	0	47,417
Centersquare Investment Management	759,903	0	0	0	759,903
Cevian Capital	112,573	3,908	0	0	116,481
CIM Group	187,500	37,313	332,023	63,208	620,044
Clarion Partners	230,616	10,920	0	0	241,536
Colony Investors	0	0	0	0	0
Columbia Capital	0	17,538	0	0	17,538
Corrum Capital	133,579	57,693	(15,699)	0	175,573
DC Capital	0	1,943	279,753	0	281,696
Drive Capital	652,307	89,164	1,514,041	0	2,255,512
Dyal Capital Partners	399,176	76,427	869,155	0	1,344,758
Energy & Mineral Group	469,688	52,766	2,789,404	0	3,311,858
Fortress Investment Group	4,094	35,440	0	0	39,534
Franscisco Partners	39,406	38,954	184,385	0	262,745
Grey Rock Energy Partners	400,111	168,952	(888,731)	0	(319,668)
Grove Street Partners	449,125	0	15,052,427	0	15,501,552
Heartwood Partners	166,459	34,752	696,340	0	897,551
Indus Capital Partners	251,552	35,712	1,364,311	0	1,651,575
Kennedy Capital	769,592	0	0	0	769,592
KKR	179,582	97,501	278,296	0	555,379
KPS Capital Partners	97,262	71,972	0	0	169,234
Long Ridge Equity Partners	200,000	55,579	1,186,671	1,670	1,443,920
Longford Investments	816,307	79,138	163,016	0	1,058,461
Luxor Capital Group	6,015	0	0	0	6,015

Continued on next page.

(1) *Fund Pass Through Expenses* are administrative expenses charged to the fund and paid by the limited partners (or investors, including MPERS), in addition to the management fee. These expenses may include, but are not limited to, accounting, audit, legal, and custody expenses directly related to the administration of the underlying fund investments.

(2) *Portfolio Company Expenses* are fees or costs paid to the general partners (fund managers) of private equity funds which are not applied as offsets to gross management fees. These charges are paid by the underlying portfolio companies of the funds, and therefore, are indirectly paid by MPERS.

Schedule of Investment Expenses

Expenses Accrued, Fiscal Year 2021 (continued)

Manager	Base Fees	Pass Through Fund Expenses(1)	Performance Fees	Portfolio Company Expenses(2)	Total
M&G Investments	$ 65,468	$ 3,453,987	$ 97,713	$ 0	$ 3,617,168
Metacapital Management	40,368	0	0	0	40,368
MGG Investment Group	263,356	251,306	56,364	0	571,026
Millennium Management	3,056,723	0	1,070,445	0	4,127,168
Miravast	102,586	17,096	150,054	0	269,736
MKH	163,954	3,846	0	0	167,800
Monomoy Capital Partners	19,567	54,822	1,164,888	30,781	1,270,058
Natural Gas Partners	162,894	25,938	108,372	0	297,204
New Mountain Capital	93,002	34,479	143,942	0	271,423
New Quest Capital Partners	124,622	28,917	647,169	0	800,708
Nexus Investments	230,013	0	0	0	230,013
Northern Shipping	208,183	33,339	83,951	0	325,473
Oak Street Real Estate	203,687	82,422	1,344,247	0	1,630,356
OCP Asia Limited	439,742	77,696	69,779	0	587,217
Octagon Credit Investors	177,398	0	0	0	177,398
OpenGate Capital	116,346	20,883	1,404,931	0	1,542,160
Orion Mine Finance	416,981	227,929	1,395,656	0	2,040,566
Owl Rock Capital	208,292	56,650	109,214	0	374,156
Parametric	370,290	0	0	0	370,290
Pentwater Capital Management	310,318	0	0	0	310,318
Pfingsten Partners	124,981	5,503	0	0	130,484
Principal Real Estate Investors	704,211	0	0	0	704,211
Quantum Energy Partners	254,538	23,486	3,051	0	281,075
Ridgewood Energy	310,503	81,802	27,358	0	419,663
Riverstone Credit	248,557	219,260	(19,722)	0	448,095
Sciens	34,726	0	0	0	34,726
Sculptor Real Estate	399,144	73,720	430,697	0	903,561
Shore Capital	0	29,551	0	0	29,551
Shoreline Capital	11,770	9,155	0	587	21,512
Silchester International Investors	902,848	0	0	0	902,848
Silver Point Capital	181,877	34,055	1,394,258	0	1,610,190
Stockdale	111,314	149,489	0	0	260,803
Timberland Investment Resources	333,984	0	0	0	333,984
Torchlight Investors	51,710	31,518	(146,479)	0	(63,251)
Tristan Capital	493,050	334,820	199,661	0	1,027,531
Turnbridge Capital	169,659	58,607	0	0	228,266
Varde Partners	145,229	28,639	280,264	0	454,132
Total Manager Expenses	**$22,026,476**	**$ 6,798,501**	**$44,711,650**	**$ 96,246**	**$73,632,873**
Professional Expenses					
Investment Custodial Fee	$ 54,402	$ 0	$ 0	$ 0	$ 54,402
Performance Management	221,442	0	0	0	221,442
General Consultant (Monitoring) Fee	344,141	0	0	0	344,141
Professional Fees	515,914	0	0	0	515,914
Other Investment Expenses	(164,812)	0	0	0	(164,812)
Total Professional Expenses	**$ 971,087**	**$ 0**	**$ 0**	**$ 0**	**$ 971,087**
Total Investment Expenses	**$22,997,563**	**$ 6,798,501**	**$44,711,650**	**$ 96,246**	**$74,603,960**

Schedule of Brokerage Commissions

Brokerage Firm	Total Commission	Number of Shares	Commission Rate
BTIG LLC	$ 51,815	2,695,539	$ 0.0192
D. A. DAVIDSON & CO.	44,702	1,420,814	0.0315
PIPER JAFFRAY & CO.	39,826	2,363,044	0.0169
RAYMOND JAMES & ASSOCIATES, INC.	29,682	2,169,720	0.0137
CREDIT SUISSE SECURITIES (USA) LLC	26,315	3,644,356	0.0072
KEEFE BRUYETTE	21,811	600,832	0.0363
STIFEL, NICOLAUS & COMPANY, INCORPORATED	16,959	12,271,866	0.0014
NATIONAL FINANCIAL SERVICES LLC	11,873	453,314	0.0262
INTL FCSTONE FINANCIAL INC.	11,448	488,465	0.0234
VIRTU AMERICAS LLC	8,453	307,453	0.0275
KEEFE BRUYETTE AND WOODS INC.	5,240	166,603	0.0315
MKM PARTNERS LLC	4,310	174,658	0.0247
WELLS FARGO SECURITIES, LLC	4,160	163,447	0.0255
JONESTRADING INSTITUTIONAL SERVICES, LLC.	4,021	201,051	0.0200
LADENBURG THALMAN & CO.	2,881	98,881	0.0291
NORTHLAND SECURITIES INC.	2,856	102,772	0.0278
CRAIG HALLUM	2,554	103,340	0.0247
WEDBUSH SECURITIES INC.	2,415	127,112	0.0190
COMPASS POINT	1,919	56,155	0.0342
B. RILEY AND CO., LLC	1,881	94,864	0.0198
MORGAN STANLEY & CO INC. NEW YORK	1,780	59,348	0.0300
BARCLAYS BANK PLC (ALL U.K. OFFICES)	1,778	52,321	0.0340
SIDOTI & COMPANY LLC	1,671	44,956	0.0372
ROTH CAPITAL PARTNERS LLC	1,391	42,906	0.0324
OTHERS	13,975	943,962,158	0.0000
Total	**$ 315,716**	**971,865,975**	
Average Commission Rate			**$ 0.0003**

Actuarial Section

MPERS' operations continued seamlessly throughout the pandemic. Benefit payments were reliable, paid on time, and distributed every month.

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September 15, 2021

Retirement Board
Missouri Department of Transportation
and Highway Patrol Employees' Retirement System
1913 William Street
Jefferson City, Missouri 65102-1930

Ladies and Gentlemen:

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report. This report should not be relied on for any purpose other than the purpose described.

The basic financial objective of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS) is to establish and receive contributions which:

(1) When expressed in terms of percents of active member payroll, will remain approximately level from generation to generation of Missouri citizens; and

(2) When combined with present assets and future investment returns, will be sufficient to meet the present and future financial obligations of MPERS.

In order to measure progress toward this fundamental objective, MPERS has annual actuarial valuations performed. The valuations: (i) measure the present financial position, and (ii) establish contribution rates that provide for the current cost and level percent-of-payroll amortization of unfunded actuarial liabilities over a reasonable period. An actuarial valuation was performed based upon benefit conditions, data and assumptions as of June 30, 2021. This valuation indicates that contribution rates for the period beginning July 1, 2022 that are at least equal to the calculated contribution rates will meet the Board's financial objective. The calculated contribution rates are 58.00% of payroll for the 6,018 Non-Uniformed employees and 58.65% of payroll for the 1,201 Uniformed patrol employees.

The plan administrative staff provides the actuary with data for the actuarial valuation. The actuary relies on the data after reviewing it for internal and year to year consistency. Member data was not audited by the actuary. The actuary summarizes and tabulates population data in order to analyze longer term trends. We are not responsible for the accuracy or completeness of the data provided by MPERS.

One Towne Square | Suite 800 | Southfield, Michigan 48076-3723

Retirement Board
September 15, 2021
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Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Actuarial Section:

- Summary of Actuarial Assumptions and Methods
  - Probabilities of Separation from Active Employment
  - Individual Salary Increases
  - Joint Life Retirement Values
  - Probabilities of Retirement for Members
  - Probabilities of Disability for Members
- Summary of Member Data Included in Valuations
  - Active Members by Attained Age and Years of Service
  - Schedule of Active Member Valuation Data
- Solvency Test
- Derivation of Financial Experience
- Schedule of Retirees and Beneficiaries Added and Removed
- Summary of Plan Provisions
- Legislative Changes

Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Financial Section:

- Schedule of Changes in the Employer's Net Pension Liability
- Schedule of Employer's Net Pension Liability
- Schedule of Employer Contributions
- Schedule of the Actuarially Determined Contributions

Actuarial valuations are based upon assumptions regarding future activity in specific risk areas including the rates of investment return and payroll growth, eligibility for the various classes of benefits, and longevity among retired lives. These assumptions are adopted by the Board. The assumptions and the methods comply with the requirements of the Governmental Accounting Standards Board. Each actuarial valuation takes into account all prior differences between actual and assumed experience in each risk area and adjusts the contribution rates as needed. Actuarial methods and assumptions were adopted by the Board pursuant to the June 30, 2017 Experience Study and 2021 review of economic assumptions. Gabriel, Roeder, Smith & Company has produced the following reports as of June 30, 2021:

- Annual Actuarial Valuation Report
- GASB Nos. 67 and 68 Valuation Report

In order to gain a full understanding of the condition of this plan, these reports should be read in their entirety.

Retirement Board
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To the best of our knowledge, the report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board. The assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable.

The employer contributions determined in this report are based on Board funding policy. This policy is discussed on page 4 of the annual actuarial valuation report. We commend the Board for its aggressive monitoring and updating of the funding policy over the recent past. However, continued employer contributions at the current level do not guarantee benefit security. We therefore encourage the Board to continue to routinely monitor and update its funding policy and to continue to consider benefit security when doing so.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. Heidi G. Barry and Jamal Adora are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The signing actuaries are independent of the plan sponsor.

Based upon the valuation results, it is our opinion that the Missouri Department of Transportation and Highway Patrol Employees' Retirement System continues to operate in accordance with actuarial principles of level percent-of-payroll financing. It is important to the well-being of the System that it continues to receive contributions at the actuarially determined levels. It is also important to continue to monitor both the total funded status and the funded status of the retiree liabilities to ensure that the funding policy is consistent with the expected life span of the respective unfunded obligation.

Respectfully submitted,

Heidi G Barry   Jamal Adora

Heidi G. Barry, ASA, FCA, MAAA   Jamal Adora, ASA, MAAA

GRS

Valuation Date	June 30, 2021
Actuarial Cost Method	Entry Age
Amortized Method	Closed, level percent-of-payroll
Remaining Amortization Period	12 years*
Asset Valuation Methods	3-year smoothing
Actuarial Assumptions	
Investment Rate of Return	6.50%
Projected Salary Increase	3.00% to 12.45%
Cost-of-Living Adjustments	1.80% Compound
Includes Wage Inflation at	3.00%

**Single equivalent period*

An actuarial valuation is based upon an actuarial cost method, an asset valuation method, and actuarial assumptions. These methods and assumptions are chosen by the Board of Trustees after consultation with the Actuary and other advisors.

The actuarial cost method is called the Entry Age Actuarial Cost Method. This method is consistent with the Board's level percent-of-payroll funding objective. With this method, the level percent-of-payroll is determined that will fund a member's retirement benefit over the member's entire working lifetime, from date of hire (Entry Age) to date of exit from the active member population. Differences in the past between assumed and actual experience become part of unfunded actuarial accrued liabilities and are amortized with level percent-of-payroll contributions. This cost method was first used in the **June 30, 1999** valuation.

The asset valuation method is a three-year smoothed market value method in which assumed investment return is recognized immediately each year and differences between actual and assumed investment return are phased-in over a closed three-year period. This asset valuation method is intended to give recognition to the long-term accuracy of market values while filtering out and dampening short-term market swings. This method was first used in the **June 30, 1999** valuation.

The actuarial assumptions used in producing the valuation fall into two broad classes: economic assumptions and demographic assumptions. Economic assumptions refer to long-term rates of investment return, wage growth, covered population growth, and inflation. Demographic assumptions refer to retirement rates, turnover rates, disability rates, merit and seniority pay increases, and mortality rates. The current assumptions are based upon a 2012-2017 study of experience of the MPERS and a 2021 review of economic assumptions. The assumptions are reviewed from time to time to keep them reasonably current with expected experience. The next experience study is scheduled to follow the June 30, 2022 valuation.

Economic Assumptions

The investment return rate used in making the valuation was 6.50% per year, compounded annually (net after administrative expenses). This rate of return is not the assumed real rate of return. The real rate of return over wage inflation is defined to be the portion of investment return which is more than the wage inflation rate. Considering wage inflation recognition of 3.00%, the 6.50% rate translates to an assumed real rate of return over wage inflation of 3.50%. This rate was first used for the **June 30, 2021** valuation.

Pay increase assumptions for individual active members are shown on Table I. Part of the assumption for each year of service is for a merit and/or seniority increase, and the other 3.00% recognizes wage inflation. These rates were first used for the **June 30, 2018** valuation.

Price Inflation is assumed to be 2.25%. This results in a 1.80% annual COLA assumption. It is assumed that the 1.80% COLA will always be paid.

The Active Member Group size is assumed to remain constant at its present level.

The active member payroll for all members is assumed to increase 3.00% annually.

Non-Economic Assumptions

The mortality table used to measure Post-Retirement Healthy Mortality Rates are from the RP-2014 Healthy Annuitant Mortality Tables projected to 2022 using projection scale MP-2017, shown in Table II. Post-Retirement Disabled Mortality Rates use the RP-2014 Disabled Retiree Annuitant Mortality Tables projected to 2022 using projection scale MP-2017, shown in Table III. Pre-Retirement Mortality Rates use the RP-2014 Employee Mortality Tables projected to 2022 using projection scale MP-2017 and multiplied by a factor of 65%, shown in Table IV. These tables were first used for the **June 30, 2018** valuation.

The probabilities of retirement for members eligible to retire are shown on Table VI. The rates for full retirement were first used in the **June 30, 2018** valuation. The rates for reduced retirement were first used in the **June 30, 2018** valuation. Upon retirement, members are assumed to pick the BackDROP period that when combined with the remaining annuity produces the highest liability.

The probabilities of disability for members eligible to retire are shown on Table VII. The rates for disability were first used in the **June 30, 2018** valuation.

The probabilities of withdrawal from service, death-in-service and disability are shown for sample ages on Table VIII. The death-in-service and disability rates were first used in the **June 30, 2018** valuation. The withdrawal rates were first used in the **June 30, 2018** valuation.

The data about persons now covered and about present assets was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary. Data was furnished as of May 31 and assumed to be statistically equivalent to June 30.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA).

Probabilities of Separation From Active Employment Less Than 5 Years of Service

	MoDOT, Civilian Patrol and MPERS		Uniformed Patrol	
Service	**Male**	**Female**	**Male**	**Female**
0 – 1	30.00%	20.00%	12.00%	12.00%
1 – 2	16.00%	14.00%	6.00%	6.00%
2 – 3	9.00%	11.00%	2.50%	2.50%
3 – 4	7.00%	9.00%	2.50%	2.50%
4 – 5	5.50%	6.00%	2.50%	2.50%

Probabilities of Separation From Active Employment More Than 5 Years of Service

	MoDOT, Civilian Patrol and MPERS		Uniformed Patrol	
Age	**Male**	**Female**	**Male**	**Female**
25	5.60%	6.00%	1.89%	1.89%
30	5.60%	6.00%	1.89%	1.89%
35	5.25%	6.00%	1.34%	1.34%
40	4.90%	5.54%	0.79%	0.79%
45	2.80%	4.32%	0.55%	0.55%
50	2.10%	3.00%	0.32%	0.32%
55	1.40%	3.00%	0.16%	0.16%
60	1.40%	3.00%	0.12%	0.12%

Salary Increase Assumptions
Service Based
% Merit Increases in Salaries Next Year

Service Index	MoDOT, Civilian Patrol and MPERS Rate	Uniformed Patrol Rate
1	6.80%	9.45%
2	4.50%	5.00%
3	2.80%	2.75%
4	1.50%	2.50%
5	1.00%	2.00%
6	0.80%	1.50%
7	0.00%	1.25%
8	0.00%	1.25%
9	0.00%	1.00%
10	0.00%	0.75%
11	0.00%	0.75%
12	0.00%	0.75%
13	0.00%	0.50%
14	0.00%	0.50%
15	0.00%	0.25%
16	0.00%	0.25%
17	0.00%	0.25%
18	0.00%	0.25%
19	0.00%	0.25%
20	0.00%	0.25%
21	0.00%	0.00%
22	0.00%	0.00%
23	0.00%	0.00%
24	0.00%	0.00%
25	0.00%	0.00%

Joint Life Retirement Values
(6.50% Interest)

Sample Attained	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
Ages	Men	Women	Men	Women	Men	Women
50	$157.18	$162.18	0.3922%	0.2660%	32.36	34.85
55	148.88	154.45	0.5582%	0.3734%	28.05	30.34
60	138.85	144.94	0.7938%	0.5667%	23.89	25.97
65	126.89	133.47	1.1511%	0.8398%	19.90	21.76
70	112.78	119.67	1.7034%	1.2770%	16.11	17.74
75	96.54	103.58	2.6823%	2.0723%	12.58	13.97
80	78.84	85.72	4.5024%	3.5553%	9.41	10.56

The present values shown above are for illustrative purposes only and include a 50% survivor benefit but do not include the value of future post-retirement increases. Males are assumed to be 3 years older than their spouses.

Percent of Eligible Active Members Retiring Next Year
(Rates of Retirement)

Closed and Year 2000 Plans

	MoDOT, Civilian Patrol and MPERS				Uniformed Patrol	
	Male		Female		Male	Female
Age	Normal	Early	Normal	Early	Normal	
50	40.00%	0.00%	25.00%	0.00%	45.00%	45.00%
55	27.00%	3.00%	32.00%	3.00%	25.00%	25.00%
60	19.00%	5.00%	22.00%	5.00%	100.00%	100.00%
65	35.00%	0.00%	35.00%	0.00%	100.00%	100.00%
70	40.00%	0.00%	50.00%	0.00%	100.00%	100.00%

Year 2000 – 2011 Tier

	MoDOT, Civilian Patrol and MPERS Normal		Uniformed Patrol	
Age	Age & Service	Rule of 90	Early	Normal
55	0.00%	30.00%	0.00%	30.00%
60	0.00%	30.00%	0.00%	100.00%
65	0.00%	30.00%	10.00%	100.00%
70	100.00%	100.00%	0.00%	100.00%

Percent of Members Becoming Disabled at the Indicated Age
(Rates of Disability)

	MoDOT, Civilian Patrol and MPERS		Uniformed Patrol	
Age	Male	Female	Male	Female
25	0.08%	0.08%	0.10%	0.10%
30	0.10%	0.10%	0.10%	0.10%
35	0.13%	0.13%	0.10%	0.10%
40	0.17%	0.17%	0.10%	0.10%
45	0.27%	0.27%	0.10%	0.10%
50	0.46%	0.46%	0.10%	0.10%
55	0.86%	0.86%	0.10%	0.10%
60	1.49%	1.49%	0.10%	0.10%

Schedule of Funding Progress

Year Ending June 30	Actuarial Asset Value	Entry Age Accrued Liability	Unfunded Accrued Liability	Funded Ratio	Actuarial Covered Payroll[1]	UAAL as a Percentage of Covered Payroll
2012[2]	$1,531,033,613	$3,306,278,671	$1,775,245,058	46.31%	$341,637,559	519.63%
2013[2]	1,657,402,393	3,583,975,559	1,926,573,166	46.24%	329,481,506	584.73%
2014	1,795,264,291	3,650,241,741	1,854,977,450	49.18%	336,590,797	551.11%
2015	1,967,001,509	3,715,845,651	1,748,844,142	52.94%	342,264,593	510.96%
2016	2,086,654,348	3,761,733,004	1,675,078,656	55.47%	344,275,147	486.55%
2017	2,172,787,144	3,802,443,730	1,629,656,586	57.14%	356,142,973	457.58%
2018[2]	2,274,248,122	3,981,838,941	1,707,590,819	57.12%	353,371,000	483.23%
2019	2,415,343,431	4,037,369,708	1,622,026,277	59.82%	362,356,771	447.63%
2020	2,481,329,531	4,092,097,897	1,610,768,366	60.64%	363,572,158	443.04%
2021[2]	2,711,272,503	4,344,072,912	1,632,800,409	62.41%	358,987,667	454.83%

(1) Values are estimated from contribution rate and amount.

(2) New assumptions and/or methods adopted.

See Note 5 of Notes to the Financial Statements in the Financial Section for funding policy information.

Member and Employer Contribution Rates

Year Ended June 30	Employer Contributions All Benefit Structures: Uniformed Patrol Group	Employer Contributions All Benefit Structures: Non-Uniformed Group	Member Contributions 2011 Tier All Groups
2012	58.63%	45.45%	4.00%
2013	55.03%	50.92%	4.00%
2014	55.23%	54.25%	4.00%
2015	58.19%	58.76%	4.00%
2016	57.76%	58.05%	4.00%
2017	58.00%	58.00%	4.00%
2018	58.00%	58.00%	4.00%
2019	58.00%	58.00%	4.00%
2020	58.00%	58.00%	4.00%
2021	58.65%	58.00%	4.00%

See Required Supplementary Information, Schedule of Employers' Contributions for more Information.

Summary of Member Data Included in Valuations

	Non-Uniformed				
	Civilian Patrol	MoDOT and MPERS	Non-Uniformed Total	Uniformed Patrol	Grand Total
Active Members					
Closed Plan	214	1,146	1,360	411	1,771
Year 2000 Plan (Closed)	360	1,449	1,809	359	2,168
Year 2000 Plan – 2011 Tier (Open)	502	2,347	2,849	431	3,280
Total Active Members	1,076	4,942	6,018	1,201	7,219
Total Active Members Prior Year	*1,090*	*5,061*	*6,151*	*1,204*	*7,355*
Retiree – Regular Pensioners					
Closed Plan	483	3,238	3,721	1,033	4,754
Year 2000 Plan (Closed)	629	3,702	4,331	9	4,340
Year 2000 Plan – 2011 Tier (Open)	7	11	18	0	18
Total Regular Pensioners	1,119	6,951	8,070	1,042	9,112
Self Insured Disability Pensioners	2	39	41	3	44
Fully Insured Disability Pensioners	10	66	76	3	79
Terminated Vested Members	258	1,699	1,957	176	2,133
Total	**2,465**	**13,697**	**16,162**	**2,425**	**18,587**
Active Member Valuation Payroll	$49,958,709	$218,770,482	$ 268,729,191	$ 84,465,380	$ 353,194,571
Active Member Valuation Payroll Prior Year	*$49,999,727*	*$226,738,711*	*$ 276,738,438*	*$ 84,113,107*	*$ 360,851,545*
Unfunded Actuarial Accrued Liability	N/A	N/A	$1,142,965,822	$489,834,587	$1,632,800,409

Member data for actuarial valuation is as of May 31, 2021.

MoDOT and MPERS

Closed Plan

	Counted by Complete Years of Service to Valuation Date							Totals	
Attained Age	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	No.	Valuation Payroll
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	0	0	0	0	0	0	0	0	0
25 – 29	0	0	0	0	0	0	0	0	0
30 – 34	0	0	0	0	0	0	0	0	0
35 – 39	0	0	0	0	1	0	0	1	41,170
40 – 44	0	1	2	1	80	2	0	86	4,241,868
45 – 49	0	0	0	2	142	101	1	246	13,642,429
50 – 54	0	1	4	7	132	202	54	400	22,385,268
55 – 59	1	2	3	3	73	86	86	254	13,884,571
60 – 64	0	1	0	1	44	44	35	125	6,376,826
65 – 69	0	0	0	0	10	13	8	31	1,656,025
70+	0	0	0	0	0	0	3	3	269,125
Totals	**1**	**5**	**9**	**14**	**482**	**448**	**187**	**1,146**	**$ 62,497,282**

Average Age	**52.7 years**
Average Service	**26.0 years**
Average Pay	**$54,535**

Year 2000 Plan

	Counted by Complete Years of Service to Valuation Date							Totals	
Attained Age	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	No.	Valuation Payroll
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	0	0	0	0	0	0	0	0	0
25 – 29	0	0	0	0	0	0	0	0	0
30 – 34	2	5	30	1	0	0	0	38	1,588,659
35 – 39	6	6	112	89	2	0	0	215	10,328,001
40 – 44	3	12	73	165	46	0	0	299	14,652,042
45 – 49	4	16	77	103	49	0	0	249	11,376,227
50 – 54	10	8	71	112	30	0	0	231	10,128,400
55 – 59	8	6	61	100	45	1	0	221	9,399,076
60 – 64	1	6	59	64	25	1	0	156	6,641,675
65 – 69	0	1	14	16	7	0	0	38	1,762,479
70+	0	0	0	2	0	0	0	2	97,630
Totals	**34**	**60**	**497**	**652**	**204**	**2**	**0**	**1,449**	**$ 65,974,189**

Average Age	**48.6 years**
Average Service	**15.6 years**
Average Pay	**$45,531**

Member data for actuarial valuation is as of May 31, 2021.

Active Members by Attained Age and Years of Service

MoDOT and MPERS

Year 2000 Plan – 2011 Tier

Attained Age	Counted by Complete Years of Service to Valuation Date: 0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	Totals: No.	Valuation Payroll
< 20	7	0	0	0	0	0	0	7	$ 199,723
20 – 24	191	0	0	0	0	0	0	191	6,352,987
25 – 29	363	96	0	0	0	0	0	459	18,798,595
30 – 34	252	168	1	0	0	0	0	421	16,799,659
35 – 39	194	125	2	0	0	0	0	321	12,127,830
40 – 44	166	94	1	0	0	0	0	261	9,919,648
45 – 49	137	75	1	0	0	0	0	213	8,094,324
50 – 54	112	77	2	0	0	0	0	191	7,218,342
55 – 59	84	79	1	1	0	0	0	165	6,357,456
60 – 64	41	51	0	0	0	0	0	92	3,435,435
65 – 69	10	13	0	0	0	0	0	23	885,187
70+	1	2	0	0	0	0	0	3	109,826
Totals	**1,558**	**780**	**8**	**1**	**0**	**0**	**0**	**2,347**	**$ 90,299,012**

Average Age	**38.2 years**
Average Service	**3.8 years**
Average Pay	**$38,474**

Member data for actuarial valuation is as of May 31, 2021.

Uniformed Patrol

Closed Plan

Attained Age	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	No.	Valuation Payroll
	Counted by Complete Years of Service to Valuation Date							Totals	
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	0	0	0	0	0	0	0	0	0
25 – 29	0	0	0	0	0	0	0	0	0
30 – 34	0	0	0	0	0	0	0	0	0
35 – 39	0	0	0	0	0	0	0	0	0
40 – 44	0	0	1	0	14	0	0	15	1,222,136
45 – 49	0	0	0	1	81	52	0	134	11,401,055
50 – 54	1	0	0	1	34	143	23	202	17,328,138
55 – 59	0	0	0	0	6	25	27	58	4,981,461
60 – 64	0	0	0	0	0	1	1	2	154,681
65 – 69	0	0	0	0	0	0	0	0	0
70+	0	0	0	0	0	0	0	0	0
Totals	**1**	**0**	**1**	**2**	**135**	**221**	**51**	**411**	**$ 35,087,471**

Average Age	**50.8 years**
Average Service	**26.2 years**
Average Pay	**$85,371**

Year 2000 Plan

Attained Age	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	No.	Valuation Payroll
	Counted by Complete Years of Service to Valuation Date							Totals	
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	0	0	0	0	0	0	0	0	0
25 – 29	0	0	0	0	0	0	0	0	0
30 – 34	0	3	31	0	0	0	0	34	2,224,573
35 – 39	0	0	74	30	0	0	0	104	7,477,161
40 – 44	0	0	27	88	15	0	0	130	10,305,020
45 – 49	0	1	12	38	14	0	0	65	4,885,158
50 – 54	0	0	4	9	6	0	0	19	1,421,750
55 – 59	0	0	2	3	2	0	0	7	532,244
60 – 64	0	0	0	0	0	0	0	0	0
65 – 69	0	0	0	0	0	0	0	0	0
70+	0	0	0	0	0	0	0	0	0
Totals	**0**	**4**	**150**	**168**	**37**	**0**	**0**	**359**	**$ 26,845,906**

Average Age	**41.4 years**
Average Service	**15.7 years**
Average Pay	**$74,780**

Member data for actuarial valuation is as of May 31, 2021.

Active Members by Attained Age and Years of Service

Uniformed Patrol

Year 2000 Plan – 2011 Tier

Attained Age	Counted by Complete Years of Service to Valuation Date: 0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	Totals: No.	Valuation Payroll
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	54	0	0	0	0	0	0	54	2,958,952
25 – 29	120	36	0	0	0	0	0	156	8,677,309
30 – 34	46	89	19	0	0	0	0	154	8,938,754
35 – 39	6	26	10	0	0	0	0	42	2,492,260
40 – 44	5	10	5	0	0	0	0	20	1,167,646
45 – 49	0	0	1	0	0	0	0	1	61,955
50 – 54	0	2	1	0	0	0	0	3	175,742
55 – 59	0	1	0	0	0	0	0	1	59,385
60 – 64	0	0	0	0	0	0	0	0	0
65 – 69	0	0	0	0	0	0	0	0	0
70+	0	0	0	0	0	0	0	0	0
Totals	**231**	**164**	**36**	**0**	**0**	**0**	**0**	**431**	**$ 24,532,003**

Average Age	**30.2 years**
Average Service	**5.0 years**
Average Pay	**$56,919**

Member data for actuarial valuation is as of May 31, 2021.

Civilian Patrol

Closed Plan

Attained Age	Counted by Complete Years of Service to Valuation Date 0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	Totals No.	Valuation Payroll
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	0	0	0	0	0	0	0	0	0
25 – 29	0	0	0	0	0	0	0	0	0
30 – 34	0	0	0	0	0	0	0	0	0
35 – 39	0	0	0	0	0	0	0	0	0
40 – 44	0	0	0	0	13	1	0	14	705,934
45 – 49	0	1	0	0	23	19	0	43	2,393,496
50 – 54	0	1	3	1	21	26	13	65	3,567,264
55 – 59	0	0	1	2	16	18	18	55	3,107,876
60 – 64	0	0	2	1	6	12	8	29	1,416,301
65 – 69	0	0	0	0	2	3	2	7	416,818
70+	0	0	0	0	0	0	1	1	38,040
Totals	**0**	**2**	**6**	**4**	**81**	**79**	**42**	**214**	**$ 11,645,729**

Average Age	**53.7 years**
Average Service	**26.1 years**
Average Pay	**$54,419**

Year 2000 Plan

Attained Age	Counted by Complete Years of Service to Valuation Date 0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	Totals No.	Valuation Payroll
< 20	0	0	0	0	0	0	0	0	$ 0
20 – 24	0	0	0	0	0	0	0	0	0
25 – 29	0	0	0	0	0	0	0	0	0
30 – 34	0	4	6	0	0	0	0	10	429,970
35 – 39	0	3	38	14	0	0	0	55	2,888,241
40 – 44	3	6	27	48	9	0	0	93	5,026,930
45 – 49	0	1	20	22	10	0	0	53	2,703,102
50 – 54	0	5	20	29	4	0	0	58	2,775,454
55 – 59	3	1	19	18	11	0	0	52	2,483,369
60 – 64	0	0	10	13	3	1	0	27	1,219,693
65 – 69	0	2	6	0	1	0	0	9	348,868
70+	0	0	2	1	0	0	0	3	86,352
Totals	**6**	**22**	**148**	**145**	**38**	**1**	**0**	**360**	**$ 17,961,979**

Average Age	**47.7 years**
Average Service	**15.0 years**
Average Pay	**$49,894**

Member data for actuarial valuation is as of May 31, 2021.

Civilian Patrol

Year 2000 Plan – 2011 Tier

Attained Age	Counted by Complete Years of Service to Valuation Date 0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	Totals No.	Valuation Payroll
< 20	1	0	0	0	0	0	0	1	$ 22,344
20 – 24	18	0	0	0	0	0	0	18	675,686
25 – 29	85	24	0	0	0	0	0	109	4,635,568
30 – 34	42	50	3	0	0	0	0	95	4,164,187
35 – 39	27	26	6	0	0	0	0	59	2,527,559
40 – 44	28	16	2	0	0	0	0	46	1,809,985
45 – 49	20	23	3	0	0	0	0	46	1,811,397
50 – 54	26	22	3	0	0	0	0	51	1,989,307
55 – 59	19	15	2	0	0	0	0	36	1,343,452
60 – 64	15	18	0	0	0	0	0	33	1,091,646
65 – 69	1	5	1	0	0	0	0	7	234,990
70+	0	1	0	0	0	0	0	1	44,880
Totals	**282**	**200**	**20**	**0**	**0**	**0**	**0**	**502**	**$ 20,351,001**

Average Age	**39.7 years**
Average Service	**4.6 years**
Average Pay	**$40,540**

Member data for actuarial valuation is as of May 31, 2021.

Schedule of Active Member Valuation Data

Actuarial Valuation for June 30	Number of Participating Employers	Number of Active Members	Covered Payroll	Average Pay	Percent Change in Average Pay from Prior Year
2012	3	7,458	$329,293,168	$ 44,153	0.5%
2013	3	7,319	323,205,767	44,160	0.0
2014	3	7,390	332,085,689	44,937	1.8
2015	3	7,358	334,400,980	45,447	1.1
2016	3	7,441	339,799,379	45,666	0.5
2017	3	7,456	348,979,212	46,805	2.5
2018	3	7,391	351,496,555	47,557	1.6
2019	3	7,421	359,296,056	48,416	1.8
2020	3	7,355	360,851,545	49,062	1.3
2021	3	7,219	355,194,571	49,203	0.3
				Ten-Year Average	**1.2%**

Member data for actuarial valuation is as of May 31, 2021.

Solvency Test

The MPERS funding objective is to meet long-term benefit promises through contributions that remain approximately level from year to year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will pay all promised benefits when due – the ultimate test of financial soundness.

A solvency test is one means of checking a system's progress under its funding program. In a solvency test for a non-contributory plan, the plan's present assets (cash and investments) are compared with: 1) The liabilities for future benefits to present retired lives and 2) The liabilities for service already rendered by members. In a system that has been following the discipline of level percent-of-payroll financing, the liabilities for future benefits to present retired lives (liability 1) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by members (liability 2) will be partially covered by the remainder of present assets. The larger the funded portion of liability 2, the stronger the condition of the system.

The schedule below illustrates the history of liability 2 of the System.

Valuation Date June 30	(1) Member Contributions	(2) Retirees and Beneficiaries	(3) Active and Inactive Members	Present Valuation Assets	Portion of Present Values Covered by Present Assets			
	Millions				(1)	(2)	(3)	Total
2012*	$ 0	$ 2,133	$1,173	$1,531	100%	72%	0%	46%
2013*	1	2,333	1,250	1,657	100%	71%	0%	46%
2014	2	2,384	1,264	1,795	100%	75%	0%	49%
2015	3	2,444	1,269	1,967	100%	80%	0%	53%
2016	5	2,470	1,287	2,087	100%	84%	0%	55%
2017	8	2,488	1,306	2,173	100%	87%	0%	57%
2018*	11	2,598	1,373	2,274	100%	87%	0%	57%
2019	14	2,656	1,367	2,415	100%	90%	0%	60%
2020	18	2,726	1,348	2,481	100%	90%	0%	61%
2021*	21	2,882	1,441	2,711	100%	93%	0%	62%

**New Assumptions and/or methods.*

Derivation of Financial Experience

Actual experience will never coincide exactly with assumed experience (except by coincidence). Gains and losses may offset each other over a period of years, but sizeable year-to-year variations from assumed experience are common. Detail on the derivation of the experience gain (loss) is shown below.

UUAL Beginning of Year (at July 1)	$1,610,768,366
Normal Cost	47,889,669
Transfer In and Service Purchase – Liability	3,842,178
Contributions	(217,389,127)
Interest	106,955,781
Net Change in LTD Assets	0
Expected UAAL Before Any Changes	1,552,066,867
Effect of Benefit Changes	0
Effect of Changes of Assumptions and Methods	226,319,675
Effect of Adjustment	0
Expected UAAL After Changes	1,778,386,542
End of Year UAAL (at June 30)	1,632,800,409
Gain/(Loss) for Year	$ 145,586,133
Gain/(Loss) as a percent of actuarial accrued liabilities at start of year ($3,802.4 million)	3.6%

**Result of receiving disability information on retired members who are at or past normal retirement age.*

Valuation Date June 30	Experience Gain (Loss) as % of Beginning Accrued Liability
2012	3.2%
2013	2.1%
2014	2.1%
2015	2.4%
2016	1.1%
2017	0.1%
2018	0.6%
2019	0.7%
2020	(1.2)%
2021	3.6%

Schedule of Retirees and Beneficiaries Added and Removed

Valuation Date	Added to Rolls: Number	Added to Rolls: Annual Allowances	Removed from Rolls: Number	Removed from Rolls: Annual Allowances	Rolls End of Year: Number	Rolls End of Year: Annual Allowances	Average Annual Allowances	% Increase: Annual Allowance	% Increase: Average Annual Allowance
FY2021									
Retirees	335	$4,388,320	289	$4,630,165	7,256	$205,830,949	$28,375	1.21%	0.57%
Beneficiaries	161	2,092,581	131	1,421,420	1,909	38,802,739	20,326	4.31%	2.67%
Disabilities	14	0	25	6,652	128	843,262	6,588	0.46%	9.09%
FY2020									
Retirees	339	$4,389,004	204	$ 360,775	7,208	$203,365,258	$28,214	2.39%	0.53%
Beneficiaries	129	1,441,941	122	1,316,530	1,879	37,200,605	19,798	3.35%	2.64%
Disabilities	7	0	26	750	139	839,398	6,039	-1.93%	0.89%
FY2019									
Retirees	308	$4,104,217	187	$2,746,320	7,077	$198,618,027	$28,065	2.54%	0.78%
Beneficiaries	133	1,424,022	124	1,211,576	1,866	35,993,556	19,289	3.04%	2.87%
Disabilities	22	0	25	31,787	143	855,947	5,986	1.26%	4.80%
FY2018									
Retirees	311	$3,842,195	196	$2,780,558	6,956	$193,705,411	$27,847	1.96%	0.34%
Beneficiaries	112	1,103,494	134	855,794	1,863	34,930,984	18,750	1.97%	2.62%
Disabilities	18	0	24	26,921	148	845,327	5,712	-2.82%	2.44%
FY2017									
Retirees	352	$4,642,501	193	$3,023,457	6,846	$189,990,373	$27,752	1.29%	-1.02%
Beneficiaries	127	1,536,955	121	1,099,249	1,875	34,257,599	18,271	3.49%	3.88%
Disabilities	24	0	29	15,898	155	869,833	5,576	-3.92%	-4.54%
FY2016									
Retirees	300	$3,820,071	188	$3,032,208	6,690	$187,571,039	$28,038	2.31%	0.68%
Beneficiaries	129	1,205,294	139	889,494	1,882	33,100,896	17,588	3.18%	2.74%
Disabilities	20	0	30	5,787	155	905,306	5,841	0.21%	6.05%
FY2015									
Retirees	406	$4,669,565	176	$2,712,395	6,583	$183,337,549	$27,750	2.61%	-0.79%
Beneficiaries	113	1,290,336	126	900,991	1,874	32,080,172	17,119	2.65%	4.07%
Disabilities	21	0	25	22,387	164	903,386	5,508	-3.43%	1.87%
FY2014									
Retirees	307	$4,434,888	176	$2,317,420	6,365	$178,670,075	$28,071	3.54%	1.41%
Beneficiaries	112	1,163,441	126	863,108	1,900	31,253,184	16,449	3.91%	4.68%
Disabilities	19	6,760	25	19,831	173	935,492	5,407	3.41%	6.40%
FY2013									
Retirees	395	$5,001,943	174	$2,761,791	6,234	$172,564,478	$27,681	4.56%	0.85%
Beneficiaries	130	1,349,835	96	717,434	1,914	30,077,515	14,966	6.79%	5.00%
Disabilities	27	0	23	6,788	179	904,683	5,239	-1.88%	-3.00%
FY2012									
Retirees	413	$3,955,409	171	$2,119,116	6,013	$165,042,751	$27,448	4.10%	-0.09%
Beneficiaries	130	891,718	105	610,931	1,880	28,166,374	14,966	5.20%	3.69%
Disabilities	34	0	25	16,712	175	922,027	5,533	0.39%	-5.31%

New disabilities are covered/paid by The Standard Insurance Co.

Data of this chart is as of June 30, 2021.

Comparison of the Closed Plan, the Year 2000 Plan, and the Year 2000 Plan – 2011 Tier

For the Year Ended June 30, 2021

Plan Provision	Closed Plan	Year 2000 Plan	Year 2000 Plan - 2011 Tier
Membership Eligibility	• Members hired prior to July 1, 2000, who became vested, and worked or continue to work in a position normally requiring at least 1,040 hours of work annually.	• Members hired for the first time on or after July 1, 2000, in a position normally requiring at least 1,040 hours of work annually. • Members who left state employment prior to becoming vested and return to work (for 12 continuous months) on or after July 1, 2000, in a position normally requiring at least 1,040 hours of work annually.	• Members hired for the first time on or after January 1, 2011, in a position normally requiring at least 1,040 hours of work annually.
Normal Retirement Eligibility	• Age 65 & active with 4 years of service. • Age 65 with 5 years of service. • Age 60 with 15 years of service. • "Rule of 80"/minimum age 48. Uniformed Members Only: • Age 55 & active with 4 years of service. • Age 55 with 5 years of service. • Mandatory retirement at age 60; no minimum service requirement (active only).	• Age 62 with 5 years of service. • "Rule of 80" / minimum age 48 (active only). Uniformed Members Only: • Mandatory retirement at age 60; no minimum service requirement (active only).	• Age 67 with 5 years of service. • "Rule of 90" / minimum age 55 (active only). Uniformed Members Only: • Age 55 & active with 5 years of service (active only). • Mandatory retirement at age 60; no minimum service requirement (active only).
Early (Reduced) Retirement Eligibility	• Age 55 with 10 years of creditable service.	• Age 57 with 5 years of creditable service.	• Age 62 with 5 years of creditable service (active only).
Life Benefit	1.6% x FAP** x service (base benefit is increased by 33⅓% for uniformed patrol members only).	1.7% x FAP** x service	1.7% x FAP** x service
Temporary Benefit	Not available.	0.8% x FAP** x service Until age 62, only if retiring under "Rule of 80".	0.8% x FAP** x service Until age 62, only if retiring under "Rule of 90".
Special Benefit	Uniformed Members Only: $90/mo payable until age 65, offset by any amount earned from gainful employment (does not apply if hired on or after January 1, 1995).	Uniformed Members Only: Until age 62, if retiring under "Rule of 80" or at mandatory age 60.	Uniformed Members Only: Until age 62, if retiring under either normal retirement eligibility provision.
Death Benefit	$5,000 benefit paid to named beneficiary • Available to active employees or LTD recipients who retired after September 28, 1985. • Available to work-related disability recipients after September 28, 1985.	$5,000 benefit paid to named beneficiary • Available to active employees or LTD recipients who retire. • Available to work-related disability recipients.	$5,000 benefit paid to named beneficiary • Available to active employees or LTD recipients who retire. • Available to work-related disability recipients.

Comparison of the Closed Plan, the Year 2000 Plan, and the Year 2000 Plan – 2011 Tier

For the Year Ended June 30, 2021 (continued)

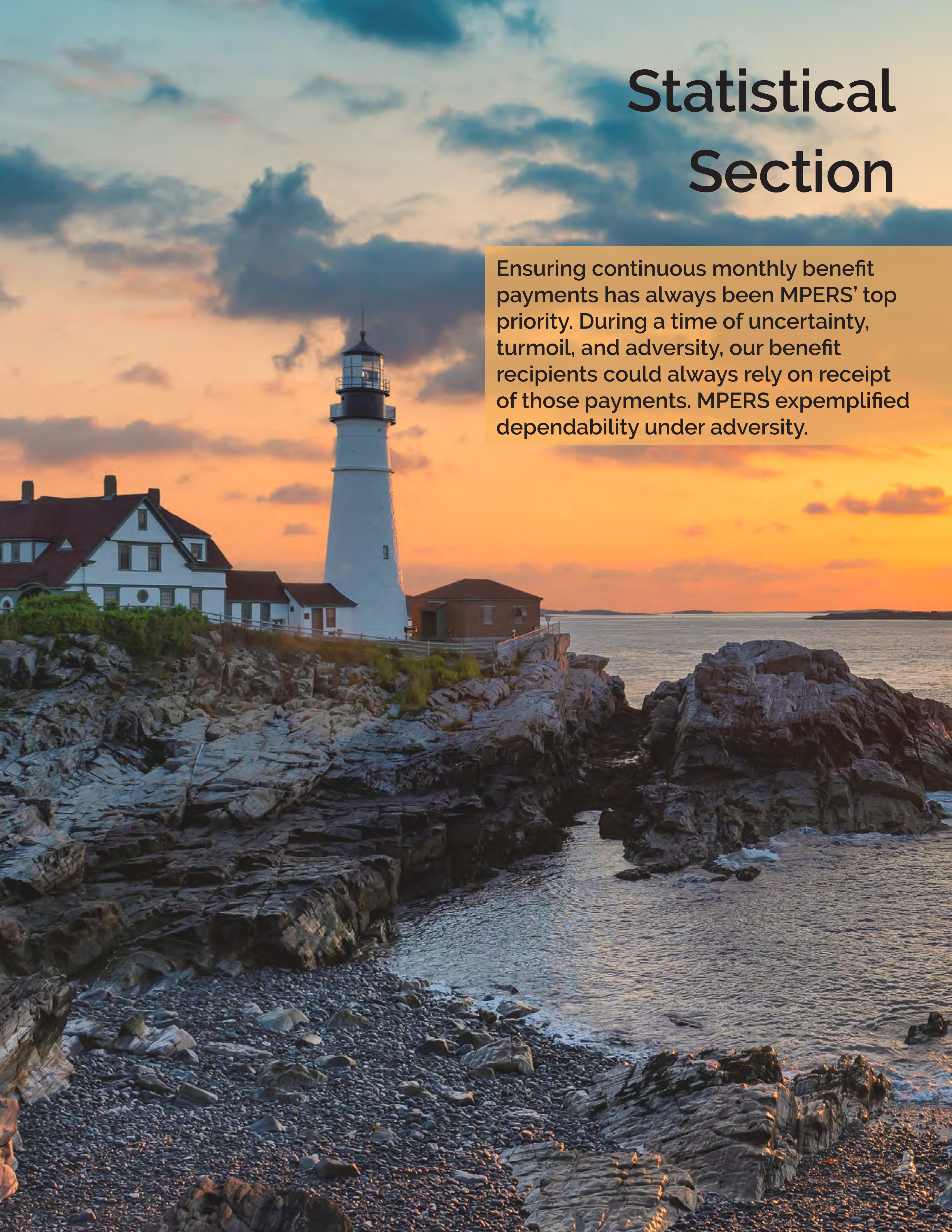
Plan Provision	Closed Plan	Year 2000 Plan	Year 2000 Plan - 2011 Tier
Vesting	5 years of service.	5 years of service.	5 years of service, if active on or after January 1, 2018.
Cost-of-Living Allowance (COLA)	Annual COLA is equal to 80% of the change in the CPI-U with a maximum rate of 5%. Exception: If hired before August 28, 1997, annual COLA is a minimum of 4% until benefit increases reach 65% of the original benefit (cap). After 65% cap is reached, annual COLA will be equal to 80% of the change in the CPI-U, with a maximum rate of 5%.	Annual COLA is equal to 80% of the change in the CPI-U with a maximum rate of 5%.	Annual COLA is equal to 80% of the change in the CPI-U with a maximum rate of 5%.
Survivor Benefit (death before retirement) Non Duty-Related Death	If employee is vested: • Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children under age 21. • If at least 3, but less than 5, years of service, the survivor benefit is calculated using 25% of the member's base benefit calculated as if the member retired on his/her date of death.	If employee is vested: • Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children under age 21.	If employee is vested: • Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children under age 21.
Duty-Related Death	• Survivor benefit to eligible spouse or children no less than 50% of final average pay (no minimum service requirement).	• Survivor benefit to eligible spouse or children no less than 50% of final average pay (no minimum service requirement).	• Survivor benefit to eligible spouse or children no less than 50% of final average pay (no minimum service requirement).
Optional Forms of Payment	Payment options include: • Life income annuity • Unreduced joint & 50% survivor • Joint & 100% survivor • 60 or 120 guaranteed payments • BackDROP	Payment options include: • Life income annuity • Joint & 50% survivor • Joint & 100% survivor • 120 or 180 guaranteed payments • BackDROP	Payment options include: • Life income annuity • Joint & 50% survivor • Joint & 100% survivor • 120 or 180 guaranteed payments
Disability	Long-term disability and work-related disability.	Long-term disability and work-related disability.	Long-term disability and work-related disability.
Employee Contributions	Non-contributory.	Non-contributory.	4% of gross pay.

**This summary describes the plan provisions in chapter 104 of the Missouri Revised Statutes. It does not overrule any other applicable statue or administrative rule and, in the event of a conflict, the applicable statue or rule would apply. The Year 2000 Plan was effective July 1, 2000 and the Year 2000 Plan – 2011 Tier was effective January 1, 2011. A complete summary is available at the MPERS office.*

***Final Average Pay (FAP) – Average of highest 36 consecutive months of pay.*

See note 2 of Notes to the Financial Statements for more information.

Effective January 1, 2021, a retiree who elected a survivor option at retirement and divorces after retirement may elect to have the benefit revert to a single life income annuity. Per the statute, MPERS must approve a divorce decree or amended divorce decree dated January 1, 2021, or after, that provides sole ownership by the member of all rights in the annuity and must further state that the former spouse shall not be entitled to any survivor benefits (per sections 104.090.7 and 104.1027, RSMo.). In addition, the member must submit a completed application.



Statistical Section

Ensuring continuous monthly benefit payments has always been MPERS' top priority. During a time of uncertainty, turmoil, and adversity, our benefit recipients could always rely on receipt of those payments. MPERS expemplified dependability under adversity.

Financial Information

The chart on page 78 details a 10-year history of the additions (revenues) and deductions (expenses) of MPERS.

The chart on page 79 details a 10-year history of benefit payments by type.

Plan Membership

Overall, MPERS' membership decreased by 22. Retired members and their beneficiaries increased by 65, terminated-vested members increased by 54, and active members decreased by 141.

Other charts and graphs in this section detail demographic information concerning our members and employers.

Sources: All non-accounting data in this section was derived from internal sources and the annual actuarial valuation reports. Member data may differ between some schedules because the valuations are performed using data as of May 31 each year.

MoDOT and Patrol Employee’s Retirement System
Changes in Net Position, Last Ten Fiscal Years

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Additions										
Employer Contributions	$164,880,140	$170,836,117	$183,353,841	$200,638,571	$199,609,396	$206,562,924	$204,955,180	$210,166,927	$210,871,852	$208,212,848
Employee Contributions	202,843	503,550	1,282,379	2,086,000	2,503,824	3,238,502	3,721,983	4,449,428	4,983,989	5,334,102
Transfers from Other System	264,954	1,727,834	1,784,382	1,114,437	2,729,679	1,752,050	1,867,445	2,432,370	3,483,574	2,080,317
Other Contributions	908,898	635,900	978,184	1,208,162	978,689	1,645,487	1,279,434	1,546,916	1,563,362	1,761,860
Net Investment Income	42,091,564	198,139,438	319,445,655	92,645,423	21,432,090	220,301,127	197,619,367	154,326,511	(10,673,270)	699,644,251
Other Income	13,760	1,650	125	148	5	614	472	307	5,412	286
Total Additions to Fiduciary Net Position	208,362,159	371,844,489	506,844,566	297,692,741	227,253,683	433,500,704	409,443,881	372,922,459	210,234,919	917,033,664
Deductions										
Benefit Payments	219,704,320	224,518,100	231,384,708	241,714,876	240,176,011	251,284,152	259,058,863	259,817,811	267,605,833	270,122,851
Administrative Expenses	2,934,969	2,997,225	3,736,355	4,066,944	4,370,860	4,515,458	4,693,492	4,372,966	4,291,028	4,585,473
Total Deductions from Fiduciary Net Position	222,639,289	227,515,325	235,121,063	245,781,820	244,546,871	255,799,610	263,752,355	264,190,777	271,896,861	274,708,324
Change in Net Position	**$ (14,277,130)**	**$144,329,164**	**$271,723,503**	**$ 51,910,921**	**$(17,293,188)**	**$177,701,094**	**$145,691,526**	**$108,731,682**	**$(61,661,942)**	**$642,325,340**

MoDOT and Patrol Employees' Retirement System
Benefit Payments by Type, Last Ten Fiscal Years

Type of Benefit	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Age and Service Benefits:										
Retiree and Survivor Annuity Payments	$195,964,396	$205,617,640	$212,840,210	$218,827,986	$224,098,038	$227,997,513	$237,850,981	$238,205,549	$245,194,376	$250,420,018
BackDROP Payments	18,138,891	13,426,923	13,438,730	16,366,338	10,677,166	16,887,349	14,546,108	15,424,880	15,787,033	13,585,357
Disability Benefits:										
Long-Term Disability	85,240	79,964	79,184	76,061	66,389	60,352	49,613	35,987	26,488	21,023
Work-Related Disability	668,821	691,227	774,541	716,047	718,009	707,953	714,197	711,990	698,794	710,841
Normal Disability	166,140	138,281	121,872	108,891	109,027	109,455	110,310	112,000	114,119	115,952
Insured Disability	1,592,517	1,512,685	1,531,578	1,554,676	1,567,825	1,620,418	1,601,605	1,615,860	1,640,971	1,600,628
Death Benefits	675,000	665,000	703,571	810,000	820,000	855,153	860,000	820,000	890,000	1,255,000
Service Transfer Payments[1]	2,410,526	2,357,080	1,876,336	3,147,482	1,921,451	2,724,631	2,823,042	2,111,007	2,457,945	1,802,900
Employee Contribution Refunds	2,789	29,300	18,686	107,395	198,106	321,328	503,007	780,538	796,107	611,132
Total Benefits	**$219,704,320**	**$224,518,100**	**$231,384,708**	**$241,714,876**	**$240,176,011**	**$251,284,152**	**$259,058,863**	**$259,817,811**	**$267,605,833**	**$270,122,851**

(1) Reciprocal transfer legislation enacted effective August 28, 2011.

Budget to Actual Report

As of June 30, 2021

	Annual Budget	Actual: Year End	Actual: % Spent	Budget Variance Favorable / (Unfavorable)
Administrative Expenses				
Salary/Benefits	$2,241,131	$2,163,499	96.5%	$ 77,632
Professional Services	346,580	339,051	97.8%	7,529
Meetings/Travel/Education	30,000	4,976	16.6%	25,024
Member Education	15,780	2,582	16.4%	13,198
Office Supplies	6,000	2,941	49.0%	3,059
Printing/Postage	29,900	24,135	80.7%	5,765
Membership Dues/Subscriptions	21,592	22,446	104.0%	(854)
Utilities	35,925	29,806	83.0%	6,119
Building Expense/Maintenance	41,910	31,058	74.1%	10,852
Rental/Lease	8,550	9,100	106.4%	(550)
Equipment/Furniture	8,400	3,515	41.8%	4,885
Information Technology	280,570	294,681	105.0%	(14,111)
Total Administrative Expenses	$3,066,338	$2,927,790	95.5%	$138,548
Investment Expenses				
Salary/Benefits	$1,995,481	$1,489,186	74.6%	$506,295
Investment Services	648,942	646,176	99.6%	2,766
Meetings/Travel/Education	58,350	6,896	11.8%	51,454
Direct Operating Expenses	43,840	42,922	97.9%	918
Total Investment Expenses	$2,746,613	$2,185,180	79.6%	$561,433
TOTALS	**$5,812,951**	**$5,112,970**	**88.0%**	**$699,981**

Reconciliation to Statement of Changes in Fiduciary Net Position, Administrative Expenses:

Total Administrative Expenses	$4,585,473
Investment General Consultant	344,141
Investment Custodian	275,844
Actuarial Experience Study	(9,000)
Depreciation Expense	(21,889)
OPEB Expense	(102,010)
OPEB Deferred Outflow	32,274
Capitalized Equipment Costs	8,137
	$5,112,970

All Members*

Amount of Monthly Benefit	Retirement: Normal	Retirement: Early	Disability: Normal	Disability: Work-Related	Disability: Long-Term	Survivor	Total Recipients
1 – 200	35	93	3	28	56	73	288
201 – 400	182	234	3	0	2	150	571
401 – 600	183	173	1	0	2	139	498
601 – 800	213	120	0	0	0	153	486
801 – 1,000	164	70	4	1	0	149	388
1,001 – 1,200	273	34	1	2	0	147	457
1,201 – 1,400	319	30	0	0	0	134	483
1,401 – 1,600	439	10	1	2	0	115	567
1,601 – 1,800	462	7	1	0	0	98	568
1,801 – 2,000	513	6	0	5	0	95	619
2,001 – 2,200	481	1	0	3	0	79	564
2,201 – 2,400	358	2	0	3	0	74	437
2,401 – 2,600	293	0	0	3	0	61	357
2,601 – 2,800	277	0	0	1	0	63	341
2,801 – 3,000	229	2	0	1	0	48	280
> 3,000	2,049	2	0	5	0	331	2,387
TOTALS	**6,470**	**784**	**14**	**54**	**60**	**1,909**	**9,291**

**This chart includes eleven retirement system staff retirees.*

MoDOT

Amount of Monthly Benefit	Retirement: Normal	Retirement: Early	Disability: Normal	Disability: Work-Related	Disability: Long-Term	Survivor	Total Recipients
1 – 200	26	68	3	24	47	67	235
201 – 400	132	193	3	0	2	129	459
401 – 600	130	139	1	0	1	120	391
601 – 800	160	107	0	0	0	138	405
801 – 1,000	114	62	4	1	0	125	306
1,001 – 1,200	198	29	1	2	0	129	359
1,201 – 1,400	263	22	0	0	0	123	408
1,401 – 1,600	356	10	1	2	0	99	468
1,601 – 1,800	383	6	1	0	0	79	469
1,801 – 2,000	436	6	0	5	0	86	533
2,001 – 2,200	417	1	0	3	0	65	486
2,201 – 2,400	314	2	0	2	0	61	379
2,401 – 2,600	259	0	0	1	0	42	302
2,601 – 2,800	233	0	0	1	0	42	276
2,801 – 3,000	202	2	0	1	0	29	234
> 3,000	1,146	1	0	4	0	227	1,378
TOTALS	**4,769**	**648**	**14**	**46**	**50**	**1,561**	**7,088**

Schedule of Retired Members by Type of Benefit

Uniformed Patrol

Amount of Monthly Benefit	Type of Benefit: Retirement – Normal	Retirement – Early	Disability – Normal	Disability – Work-Related	Disability – Long-Term	Survivor	Total Recipients
1 – 200	0	0	0	2	1	0	3
201 – 400	9	1	0	0	0	5	15
401 – 600	13	0	0	0	0	5	18
601 – 800	14	0	0	0	0	2	16
801 – 1,000	11	0	0	0	0	3	14
1,001 – 1,200	10	0	0	0	0	6	16
1,201 – 1,400	5	0	0	0	0	0	5
1,401 – 1,600	2	0	0	0	0	4	6
1,601 – 1,800	4	0	0	0	0	9	13
1,801 – 2,000	4	0	0	0	0	2	6
2,001 – 2,200	1	0	0	0	0	8	9
2,201 – 2,400	2	0	0	1	0	9	12
2,401 – 2,600	4	0	0	1	0	15	20
2,601 – 2,800	2	0	0	0	0	16	18
2,801 – 3,000	4	0	0	0	0	18	22
> 3,000	763	0	0	1	0	97	861
TOTALS	**848**	**1**	**0**	**5**	**1**	**199**	**1,054**

Civilian Patrol

Amount of Monthly Benefit	Type of Benefit: Retirement – Normal	Retirement – Early	Disability – Normal	Disability – Work-Related	Disability – Long-Term	Survivor	Total Recipients
1 – 200	8	25	0	2	8	6	49
201 – 400	41	40	0	0	0	16	97
401 – 600	40	34	0	0	1	14	89
601 – 800	39	13	0	0	0	13	65
801 – 1,000	39	8	0	0	0	21	68
1,001 – 1,200	65	5	0	0	0	12	82
1,201 – 1,400	51	8	0	0	0	11	70
1,401 – 1,600	80	0	0	0	0	12	92
1,601 – 1,800	75	1	0	0	0	10	86
1,801 – 2,000	73	0	0	0	0	7	80
2,001 – 2,200	62	0	0	0	0	6	68
2,201 – 2,400	42	0	0	0	0	4	46
2,401 – 2,600	29	0	0	1	0	4	34
2,601 – 2,800	42	0	0	0	0	5	47
2,801 – 3,000	23	0	0	0	0	1	24
> 3,000	134	0	0	0	0	7	141
TOTALS	**843**	**134**	**0**	**3**	**9**	**149**	**1,138**

MoDOT

By Years of Service

Retired In Fiscal Year		0 – 10	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41+
2012	Average Benefit	$ 386	$ 595	$1,303	$1,712	$2,518	$3,141	$2,945	$ 0
2012	Average FAP	$3,190	$2,791	$3,447	$3,435	$4,225	$4,303	$3,777	$ 0
2012	Current Retirees	31	20	37	59	98	54	3	0
2013	Average Benefit	$ 322	$ 661	$1,405	$1,863	$2,907	$2,993	$5,807	$3,006
2013	Average FAP	$2,691	$3,034	$3,485	$3,831	$4,335	$3,985	$5,516	$2,802
2013	Current Retirees	32	32	39	62	98	26	2	1
2014	Average Benefit	$ 320	$ 786	$1,315	$1,733	$3,092	$3,378	$3,153	$ 0
2014	Average FAP	$2,444	$3,155	$3,493	$3,874	$4,509	$4,606	$3,781	$ 0
2014	Current Retirees	27	22	19	40	75	14	2	0
2015	Average Benefit	$ 338	$ 669	$1,262	$1,783	$3,082	$3,728	$3,337	$ 0
2015	Average FAP	$2,660	$3,041	$3,424	$3,611	$4,396	$4,659	$4,286	$ 0
2015	Current Retirees	48	58	36	49	76	19	2	0
2016	Average Benefit	$ 332	$ 548	$ 936	$1,896	$3,020	$3,489	$4,450	$ 0
2016	Average FAP	$2,828	$2,710	$2,889	$3,754	$4,325	$4,727	$5,147	$ 0
2016	Current Retirees	30	23	24	45	80	14	2	0
2017	Average Benefit	$ 351	$ 583	$ 988	$1,811	$3,120	$3,863	$2,746	$ 0
2017	Average FAP	$2,568	$2,773	$3,055	$3,616	$4,639	$4,801	$3,717	$ 0
2017	Current Retirees	38	29	29	54	83	12	3	0
2018	Average Benefit	$ 324	$ 621	$1,028	$2,033	$3,092	$3,914	$3,153	$ 0
2018	Average FAP	$2,565	$3,009	$3,398	$3,917	$4,559	$4,957	$3,909	$ 0
2018	Current Retirees	30	33	38	49	69	10	1	0
2019	Average Benefit	$ 330	$ 675	$1,039	$1,867	$3,012	$3,385	$3,236	$ 0
2019	Average FAP	$2,617	$3,037	$3,444	$3,868	$4,696	$4,594	$4,015	$ 0
2019	Current Retirees	33	22	37	49	63	14	4	0
2020	Average Benefit	$ 330	$ 598	$1,166	$1,848	$3,072	$3,634	$3,728	$4,925
2020	Average FAP	$2,715	$3,118	$3,453	$3,797	$4,654	$4,890	$5,237	$5,540
2020	Current Retirees	28	26	35	59	89	7	3	2
2021	Average Benefit	$ 297	$ 731	$1,264	$1,811	$2,806	$3,169	$3,030	$2,882
2021	Average FAP	$2,881	$3,158	$3,453	$3,790	$4,342	$4,624	$4,677	$3,460
2021	Current Retirees	30	18	47	66	58	13	3	1

FAP = Final Average Pay

Uniformed Patrol

By Years of Service

Retired In Fiscal Year		0 – 10	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41+
2012	Average Benefit	$ 0	$ 829	$ 0	$4,294	$5,595	$7,051	$ 0	$ 0
2012	Average FAP	$ 0	$2,463	$ 0	$5,098	$6,012	$6,429	$ 0	$ 0
2012	Current Retirees	0	1	0	1	9	15	0	0
2013	Average Benefit	$ 637	$ 0	$1,901	$4,830	$5,723	$6,795	$9,390	$ 0
2013	Average FAP	$1,972	$ 0	$3,917	$6,507	$6,419	$6,505	$7,510	$ 0
2013	Current Retirees	2	0	2	2	8	8	1	0
2014	Average Benefit	$ 548	$ 0	$ 0	$ 0	$5,806	$7,040	$ 0	$ 0
2014	Average FAP	$2,503	$ 0	$ 0	$ 0	$6,528	$6,580	$ 0	$ 0
2014	Current Retirees	5	0	0	0	24	11	0	0
2015	Average Benefit	$ 856	$ 944	$ 0	$4,524	$5,795	$7,152	$ 0	$ 0
2015	Average FAP	$3,119	$4,458	$ 0	$6,736	$6,680	$6,951	$ 0	$ 0
2015	Current Retirees	1	1	0	2	19	10	0	0
2016	Average Benefit	$ 307	$1,144	$ 0	$4,464	$5,315	$6,821	$ 0	$ 0
2016	Average FAP	$2,599	$3,804	$ 0	$6,405	$6,559	$7,039	$ 0	$ 0
2016	Current Retirees	1	1	0	$ 4	$ 12	4	0	0
2017	Average Benefit	$ 600	$1,159	$3,218	$4,424	$5,335	$7,442	$7,751	$ 0
2017	Average FAP	$2,791	$3,804	$5,548	$5,621	$6,786	$7,148	$7,077	$ 0
2017	Current Retirees	2	2	1	1	29	2	1	0
2018	Average Benefit	$ 417	$1,115	$1,608	$4,027	$5,185	$ 0	$ 0	$ 0
2018	Average FAP	$2,566	$3,430	$3,943	$7,001	$6,771	$ 0	$ 0	$ 0
2018	Current Retirees	2	3	1	4	25	0	0	0
2019	Average Benefit	$ 372	$1,121	$1,942	$3,489	$4,976	$6,257	$ 0	$ 0
2019	Average FAP	$2,748	$3,589	$4,417	$6,051	$6,930	$7,472	$ 0	$ 0
2019	Current Retirees	3	1	2	4	33	6	0	0
2020	Average Benefit	$ 556	$ 783	$2,350	$3,508	$4,807	$5,787	$ 0	$ 0
2020	Average FAP	$3,004	$3,047	$5,530	$6,246	$6,906	$6,915	$ 0	$ 0
2020	Current Retirees	5	1	3	5	26	4	0	0
2021	Average Benefit	$ 530	$ 0	$ 0	$3,169	$4,696	$5,574	$ 0	$ 0
2021	Average FAP	$3,261	$ 0	$ 0	$6,136	$6,984	$7,164	$ 0	$ 0
2021	Current Retirees	8	0	0	5	30	6	0	0

FAP = Final Average Pay

Civilian Patrol
By Years of Service

Retired In Fiscal Year		0 – 10	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41+
2012	Average Benefit	$ 311	$ 666	$1,484	$1,502	$2,186	$2,385	$ 0	$ 0
2012	Average FAP	$2,071	$2,668	$3,501	$3,086	$3,738	$3,458	$ 0	$ 0
2012	Current Retirees	6	3	4	7	15	6	0	0
2013	Average Benefit	$ 342	$ 574	$1,202	$1,670	$1,952	$3,328	$ 0	$ 0
2013	Average FAP	$2,723	$2,556	$2,888	$3,332	$3,359	$4,003	$ 0	$ 0
2013	Current Retirees	13	8	7	9	9	6	0	0
2014	Average Benefit	$ 320	$ 604	$1,075	$1,810	$2,757	$2,169	$ 0	$ 0
2014	Average FAP	$2,319	$2,802	$2,505	$3,580	$3,792	$3,105	$ 0	$ 0
2014	Current Retirees	9	12	7	7	13	3	0	0
2015	Average Benefit	$ 316	$ 647	$1,223	$1,679	$2,359	$3,550	$ 0	$ 0
2015	Average FAP	$2,342	$2,586	$3,098	$3,453	$3,831	$4,911	$ 0	$ 0
2015	Current Retirees	12	11	7	13	12	6	0	0
2016	Average Benefit	$ 178	$ 580	$ 949	$1,943	$2,487	$4,647	$ 0	$ 0
2016	Average FAP	$2,457	$2,541	$2,989	$3,532	$3,820	$5,718	$ 0	$ 0
2016	Current Retirees	6	8	5	8	15	1	0	0
2017	Average Benefit	$ 319	$ 671	$1,247	$1,466	$2,724	$3,407	$3,176	$ 0
2017	Average FAP	$2,614	$2,712	$3,460	$3,301	$4,270	$4,425	$3,919	$ 0
2017	Current Retirees	7	5	7	13	18	5	1	0
2018	Average Benefit	$ 184	$ 686	$1,079	$1,830	$2,660	$2,550	$5,519	$ 0
2018	Average FAP	$1,955	$3,030	$3,452	$4,002	$3,996	$3,379	$7,510	$ 0
2018	Current Retirees	3	6	6	7	11	4	1	0
2019	Average Benefit	$ 442	$ 756	$ 863	$1,534	$2,262	$2,890	$ 0	$ 0
2019	Average FAP	$3,000	$3,094	$3,111	$3,228	$3,507	$3,912	$ 0	$ 0
2019	Current Retirees	5	6	6	6	6	5	0	0
2020	Average Benefit	$ 342	$ 504	$1,062	$1,833	$2,521	$2,373	$ 0	$3,812
2020	Average FAP	$2,804	$2,638	$3,176	$3,711	$4,141	$3,125	$ 0	$4,079
2020	Current Retirees	5	4	7	9	15	2	0	1
2021	Average Benefit	$ 232	$ 556	$1,020	$1,729	$3,017	$2,542	$ 0	$ 0
2021	Average FAP	$2,326	$2,991	$3,626	$3,575	$4,754	$3,188	$ 0	$ 0
2021	Current Retirees	9	10	10	11	9	1	0	0

FAP = Final Average Pay

Schedule of Average Monthly Benefit Payments

MPERS

By Years of Service

Retired In Fiscal Year		0 – 10	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41+
2012	Average Benefit	$ 0	$ 0	$ 0	$ 0	$3,283	$ 0	$ 0	$ 0
2012	Average FAP	$ 0	$ 0	$ 0	$ 0	$7,087	$ 0	$ 0	$ 0
2012	Current Retirees	0	0	0	0	1	0	0	0
2013	Average Benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 7,151	$ 0	$ 0
2013	Average FAP	$ 0	$ 0	$ 0	$ 0	$ 0	$11,108	$ 0	$ 0
2013	Current Retirees	0	0	0	0	0	1	0	$ 0
2015	Average Benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 3,090	$ 0	$ 0
2015	Average FAP	$ 0	$ 0	$ 0	$ 0	$ 0	$ 4,764	$ 0	$ 0
2015	Current Retirees	0	0	0	0	0	1	0	0
2016	Average Benefit	$ 0	$ 0	$ 0	$3,830	$ 0	$ 0	$ 0	$ 0
2016	Average FAP	$ 0	$ 0	$ 0	$9,414	$ 0	$ 0	$ 0	$ 0
2016	Current Retirees	0	0	0	1	0	0	0	0
2020	Average Benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 9,569	$ 0	$ 0
2020	Average FAP	$ 0	$ 0	$ 0	$ 0	$ 0	$12,079	$ 0	$ 0
2020	Current Retirees	0	0	0	0	0	1	0	0

Note: There were no retirements during the years not shown above.

FAP = Final Average Pay

Active Member Data

Schedule of Participating Employers

	MoDOT		Patrol		MPERS		Total	
	Employees	%	Employees	%	Employees	%	Employees	%
2012	5,093	68.42	2,337	31.39	14	0.19	7,444	100.00
2013	4,985	67.95	2,336	31.84	15	0.21	7,336	100.00
2014	5,041	67.98	2,357	31.79	17	0.23	7,415	100.00
2015	4,993	67.72	2,364	32.06	16	0.22	7,373	100.00
2016	5,059	67.70	2,398	32.09	16	0.21	7,473	100.00
2017	5,056	67.86	2,379	31.93	16	0.21	7,451	100.00
2018	5,065	68.31	2,334	31.48	16	0.21	7,415	100.00
2019	5,081	68.51	2,318	31.26	17	0.23	7,416	100.00
2020	5,031	68.59	2,287	31.18	17	0.23	7,335	100.00
2021	4,913	68.29	2,263	31.46	18	0.25	7,194	100.00

Data for this chart is as of June 30, 2021.

By Age

Closed Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<21	0	0	0	0	0
21 – 25	0	0	0	0	0
26 – 30	0	0	0	0	0
31 – 35	0	0	0	0	0
36 – 40	11	8	1	1	1
41 – 45	202	143	21	38	0
46 – 50	529	311	50	167	1
51 – 55	599	348	70	178	3
56 – 60	284	216	44	24	0
61 – 65	109	85	24	0	0
66+	16	14	2	0	0
Total	**1,750**	**1,125**	**212**	**408**	**5**
Average Age		**52**	**53**	**50**	**49**

Year 2000 Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<21	0	0	0	0	0
21 – 25	0	0	0	0	0
26 – 30	0	0	0	0	0
31 – 35	180	87	27	65	1
36 – 40	432	244	69	117	2
41 – 45	486	300	77	108	1
46 – 50	352	244	52	54	2
51 – 55	287	214	59	13	1
56 – 60	265	218	43	3	1
61 – 65	132	109	23	0	0
66+	27	22	5	0	0
Total	**2,161**	**1,438**	**355**	**360**	**8**
Average Age		**48**	**47**	**40**	**45**

Year 2000 Plan – 2011 Tier

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<21	40	37	2	1	0
21 – 25	430	295	40	95	0
26 – 30	765	485	115	164	1
31 – 35	597	390	85	121	1
36 – 40	378	299	50	29	0
41 – 45	285	222	48	14	1
46 – 50	271	217	52	1	1
51 – 55	222	173	46	3	0
56 – 60	190	152	37	0	1
61 – 65	87	66	21	0	0
66+	18	14	4	0	0
Total	**3,283**	**2,350**	**500**	**428**	**5**
Average Age		**37**	**39**	**29**	**42**

By Years of Service

Closed Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<01	0	0	0	0	0
01 – 05	2	1	0	1	0
06 – 10	12	7	4	1	0
11 – 15	11	7	4	0	0
16 – 20	28	21	5	2	0
21 – 25	870	576	100	192	2
26 – 30	610	373	64	171	2
31 – 35	166	101	23	41	1
36 – 40	36	28	8	0	0
41 – 45	13	10	3	0	0
46+	2	1	1	0	0
Total	**1,750**	**1,125**	**212**	**408**	**5**
Average Service		**25**	**26**	**26**	**27**

Year 2000 Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<01	20	19	0	0	1
01 – 05	33	26	7	0	0
06 – 10	134	90	33	10	1
11 – 15	924	581	167	172	4
16 – 20	1,009	696	138	174	1
21 – 25	37	24	9	3	1
26 – 30	2	1	1	0	0
31 – 35	2	1	0	1	0
36 – 40	0	0	0	0	0
41 – 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**2,161**	**1,438**	**355**	**360**	**8**
Average Service		**15**	**15**	**15**	**13**

Year 2000 Plan – 2011 Tier

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<01	536	409	71	56	0
01 – 05	1,873	1,408	268	195	2
06 – 10	873	532	161	177	3
11 – 15	0	0	0	0	0
16 – 20	1	1	0	0	0
21 – 25	0	0	0	0	0
26 – 30	0	0	0	0	0
31 – 35	0	0	0	0	0
36 – 40	0	0	0	0	0
41 – 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**3,283**	**2,350**	**500**	**428**	**5**
Average Service		**3**	**4**	**5**	**5**

By Age

Closed Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<21	0	0	0	0	0
21 – 25	0	0	0	0	0
26 – 30	0	0	0	0	0
31 – 35	0	0	0	0	0
36 – 40	8	8	0	0	0
41 – 45	95	77	12	5	1
46 – 50	263	193	27	43	0
51 – 55	343	268	30	45	0
56 – 60	234	207	27	0	0
61 – 65	46	43	3	0	0
66+	0	0	0	0	0
Total	**989**	**796**	**99**	**93**	**1**
Average Age		**52**	**52**	**50**	**44**

Year 2000 Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<21	0	0	0	0	0
21 – 25	0	0	0	0	0
26 – 30	1	1	0	0	0
31 – 35	89	58	16	15	0
36 – 40	234	183	37	14	0
41 – 45	241	193	28	20	0
46 – 50	193	166	19	8	0
51 – 55	123	106	14	3	0
56 – 60	79	67	12	0	0
61 – 65	14	11	3	0	0
66+	0	0	0	0	0
Total	**974**	**785**	**129**	**60**	**0**
Average Age		**45**	**43**	**40**	**0**

Year 2000 Plan – 2011 Tier

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<21	0	0	0	0	0
21 – 25	5	4	1	0	0
26 – 30	35	29	4	2	0
31 – 35	55	24	18	12	1
36 – 40	31	23	2	6	0
41 – 45	15	13	1	1	0
46 – 50	23	15	5	3	0
51 – 55	13	11	2	0	0
56 – 60	9	7	2	0	0
61 – 65	4	3	1	0	0
66+	0	0	0	0	0
Total	**190**	**129**	**36**	**24**	**1**
Average Age		**39**	**38**	**36**	**32**

By Years of Service

Closed Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<01	0	0	0	0	0
01 – 05	118	88	16	14	0
06 – 10	403	314	37	51	1
11 – 15	263	218	28	17	0
16 – 20	154	134	14	6	0
21 – 25	49	40	4	5	0
26 – 30	2	2	0	0	0
31 – 35	0	0	0	0	0
36 – 40	0	0	0	0	0
41 – 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**989**	**796**	**99**	**93**	**1**
Average Service		**11**	**11**	**10**	**8**

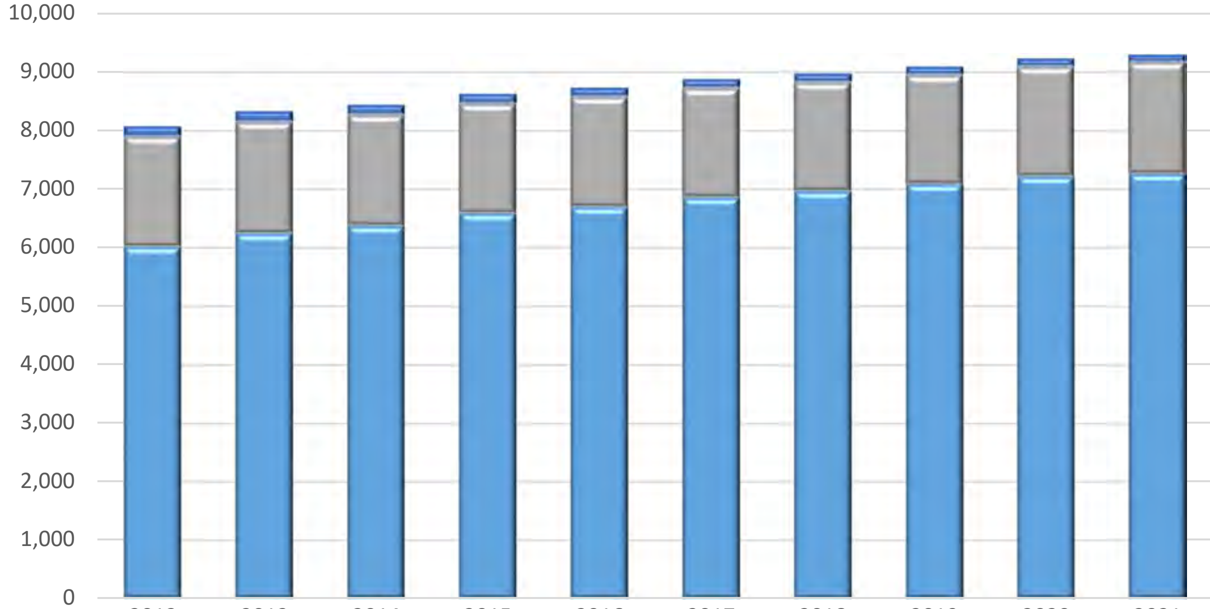
Year 2000 Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<01	0	0	0	0	0
01 – 05	118	97	18	3	0
06 – 10	564	454	73	37	0
11 – 15	248	200	33	15	0
16 – 20	44	34	5	5	0
21 – 25	0	0	0	0	0
26 – 30	0	0	0	0	0
31 – 35	0	0	0	0	0
36 – 40	0	0	0	0	0
41 – 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**974**	**785**	**129**	**60**	**0**
Average Service		**9**	**9**	**10**	**0**

Year 2000 Plan – 2011 Tier

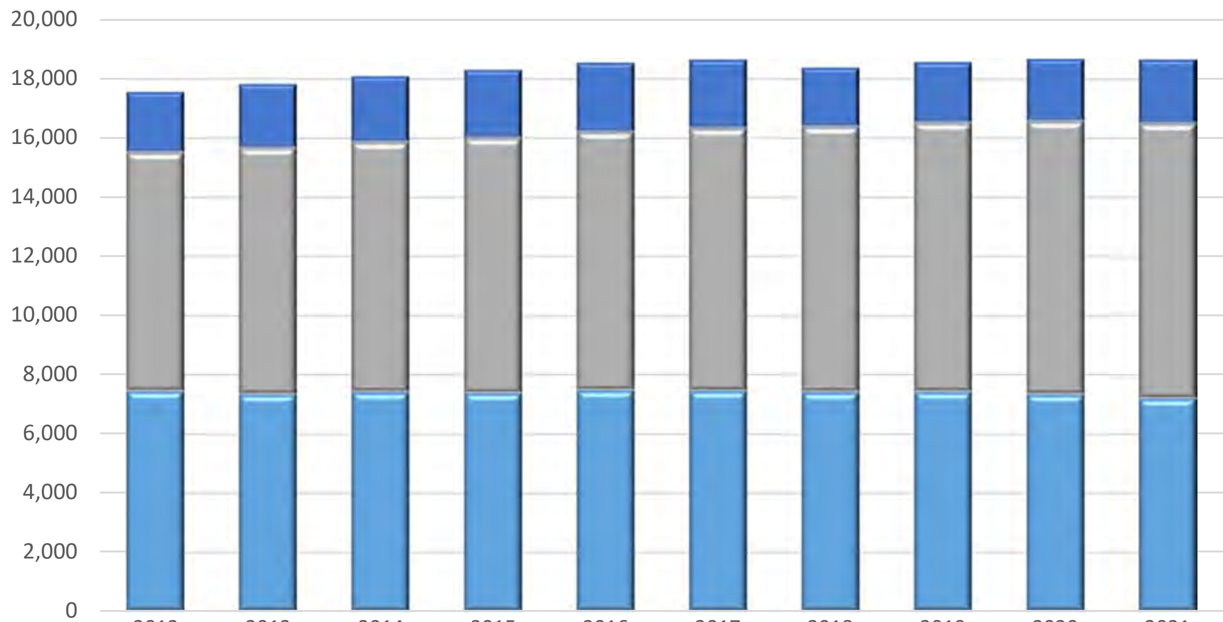
Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
<01	0	0	0	0	0
01 – 05	86	66	13	7	0
06 – 10	104	63	23	17	1
11 – 15	0	0	0	0	0
16 – 20	0	0	0	0	0
21 – 25	0	0	0	0	0
26 – 30	0	0	0	0	0
31 – 35	0	0	0	0	0
36 – 40	0	0	0	0	0
41 – 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**190**	**129**	**36**	**24**	**1**
Average Service		**6**	**6**	**6**	**7**

Benefit Recipients



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Disabilities	175	178	173	164	155	155	148	143	139	128
Survivors	1,880	1,914	1,900	1,874	1,882	1,875	1,863	1,866	1,879	1,909
Retirees	6,013	6,234	6,365	6,583	6,690	6,846	6,956	7,077	7,208	7,254

Membership Distribution

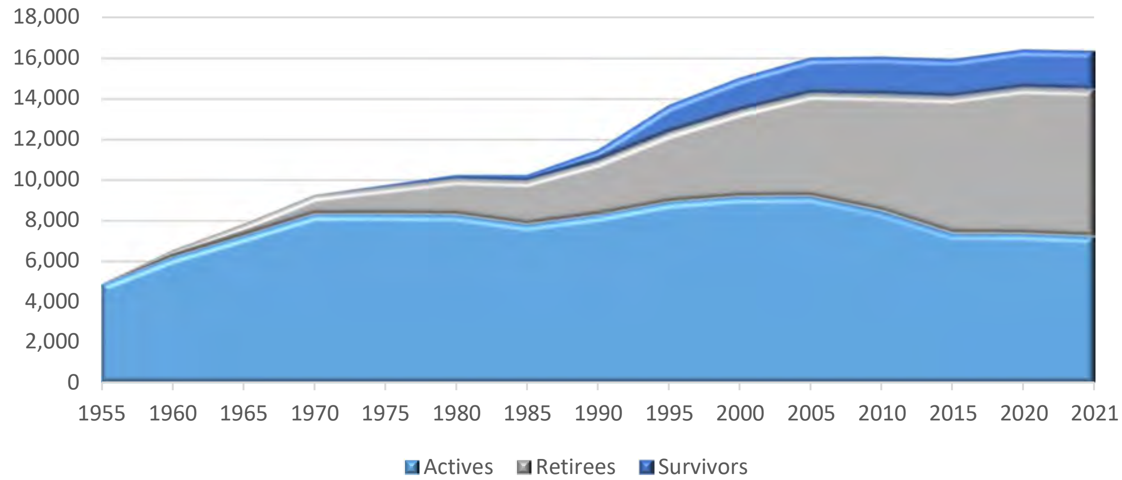


	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Term Vested Members	2,038	2,153	2,222	2,300	2,329	2,319	1,985	2,051	2,099	2,153
Benefit Recipients	8,068	8,326	8,438	8,621	8,727	8,876	8,967	9,086	9,226	9,291
Active Members	7,444	7,336	7,415	7,373	7,473	7,451	7,415	7,416	7,335	7,194

Average Years of Service for New Retirees

Final Average Pay for New Retirees

MPERS Membership Over the Years



Location of MPERS Retirees

For the Year Ended June 30, 2021

This map represents the demographic distribution of reitrees by state and country.